WORLD PETROLEUM

JUNE 1957

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In the remote arid wastelands, in the reeking jungles, in the cold climates, in the oceans, even in the cities, men are drilling for oil. Around-the-compass and around-the-clock the work is rough, expensive and increasingly important. In both drilling and producing, control of pressures is of prime importance. Cameron has designed and manufactured drilling and producing controls since the early days of the industry. In the urgency of today's activity, tough, efficient controls bearing the Cameron name are found almost everywhere oil is found. More operators every day COUNT ON CAMERON.

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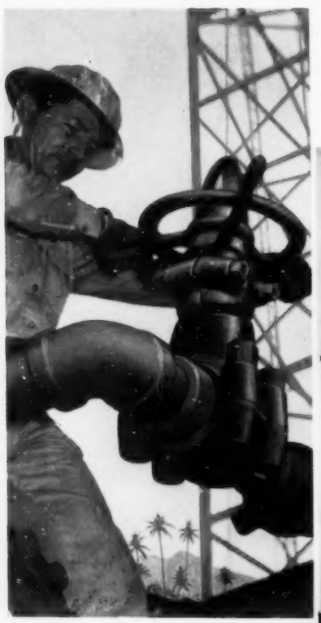

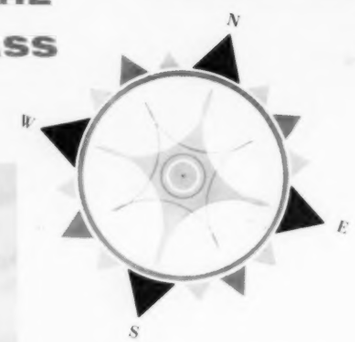

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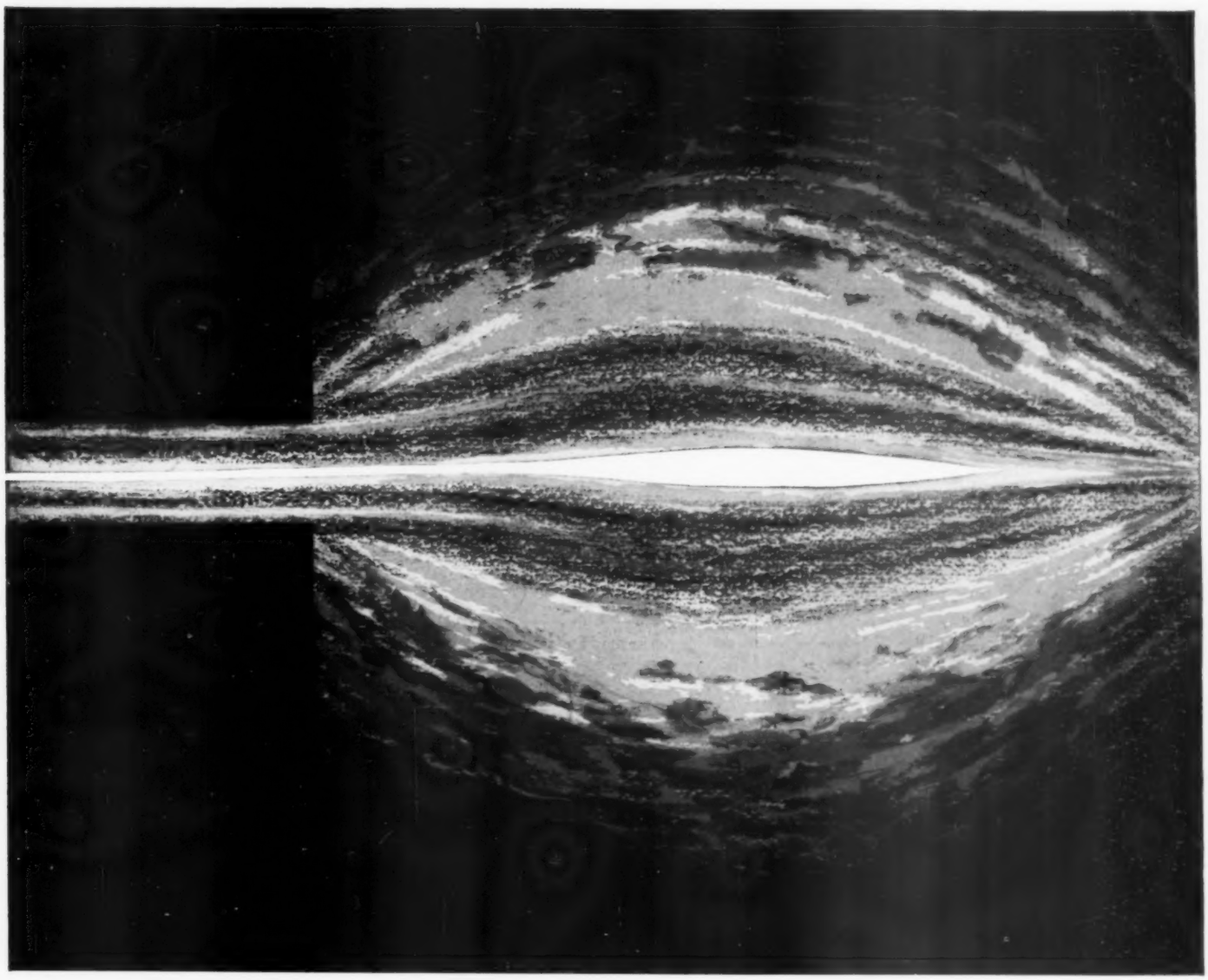

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The technique of steel furnace boosting with a jet of pure oxygen stabilizes quality and batch uniformity.
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Growing demands of scientific and industrial progress require speedier delivery in the face of increasing competition. It is vital that manufacturers employ this latest technique which shows greater economy and is only made possible by employing the proven principle of the Butterley on-site Tonnage Generator. This compact, efficient plant produced a continuous supply of Oxygen and/or Nitrogen at any desired purity and pressure, piped direct to the point of usage, in the exact quantity desired. Its efficiency eliminates production hold-ups by maintaining a constant supply, and maintenance costs are low.
The Butterley Company have acquired the sole production and sales rights of this, the most successful American Process, for the United Kingdom, British Commonwealth, and certain European countries.

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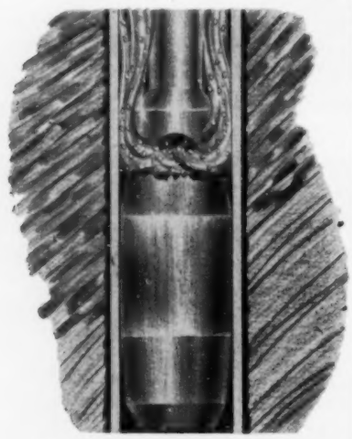

The McCullough Bridge Plug drills out easily. Average time usually runs from one to two hours. Best results have been obtained by using a regular rock bit with about one point of weight, rotating at high R.P.M. Cable tools should not be used for drilling out.

Solid Aluminum Bridge Plug Assures Positive Seal

Set in 1951, a McCullough 4½" O.D. Bridge Plug Was Re-tested in 1956 to 5500 lbs. —Without Leakage

Seldom, in an oil well, is it possible to determine the reliability of a service performed five years previously.

This well, drilled in 1951, was cased through the pay zone with 5½" O.D. 17 lb. cemented casing. A 4½" O.D. McCullough all-metal Bridge Plug was set below the pay and the formation was squeezed for water shut-off. No cement was dumped on top of the plug. The pay zone was perforated and the well put on production.

Late in 1956 water broke into the well. The operator ran in with a squeeze tool and tested the McCullough Plug at 5500 lbs. After five years it still provided a leak-proof seal.

Another 4½" O.D. McCullough Bridge Plug was set just above the perforations at 8150'. Again, no cement was dumped on the plug. This zone was also squeezed with 5500 lbs. pressure. The plug was secure and leak-proof.

It required 2½ hours to run and set the plug which was drilled out three days later in 1½ hours with a rotary rock bit.

McCullough Bridge Plugs are favorites with operators and squeeze tool men. They will withstand as much hydrostatic pressure as the casing and will last as long as the casing.

McCullough Bridge Plugs have no hardened parts—no moving parts. They are made of drillable aluminum metal. Slips, reins, rubber packers, etc. have all been eliminated. Ideal for either permanent or temporary plugging operations. Available in 37 sizes to plug in tubing, drill pipe, casing and in open hole in hard formations.

Unusual Application of McCullough Plug Shuts Off Bottom Hole Water

A production packer with 2.688" I.D. mandrel was set at 5600'. Well had been squeezed through the packer and was producing from perforations just above.

The squeeze job later failed and the well started making water through the packer mandrel. A 1¾" O.D. McCullough Bridge Plug was set in the mandrel and cement was dumped on top of the plug with a 1¾" O.D. McCullough Dump Bailer. Water shut-off was successful and the well was put back on production.

Jobs like this demonstrate the versatility of McCullough's line of Bridge Plugs. Wherever a plugging problem exists, there is a McCullough Plug to solve it.

The jobs described above are certified to be true field reports of services rendered.

McCullough® *TOOL COMPANY*

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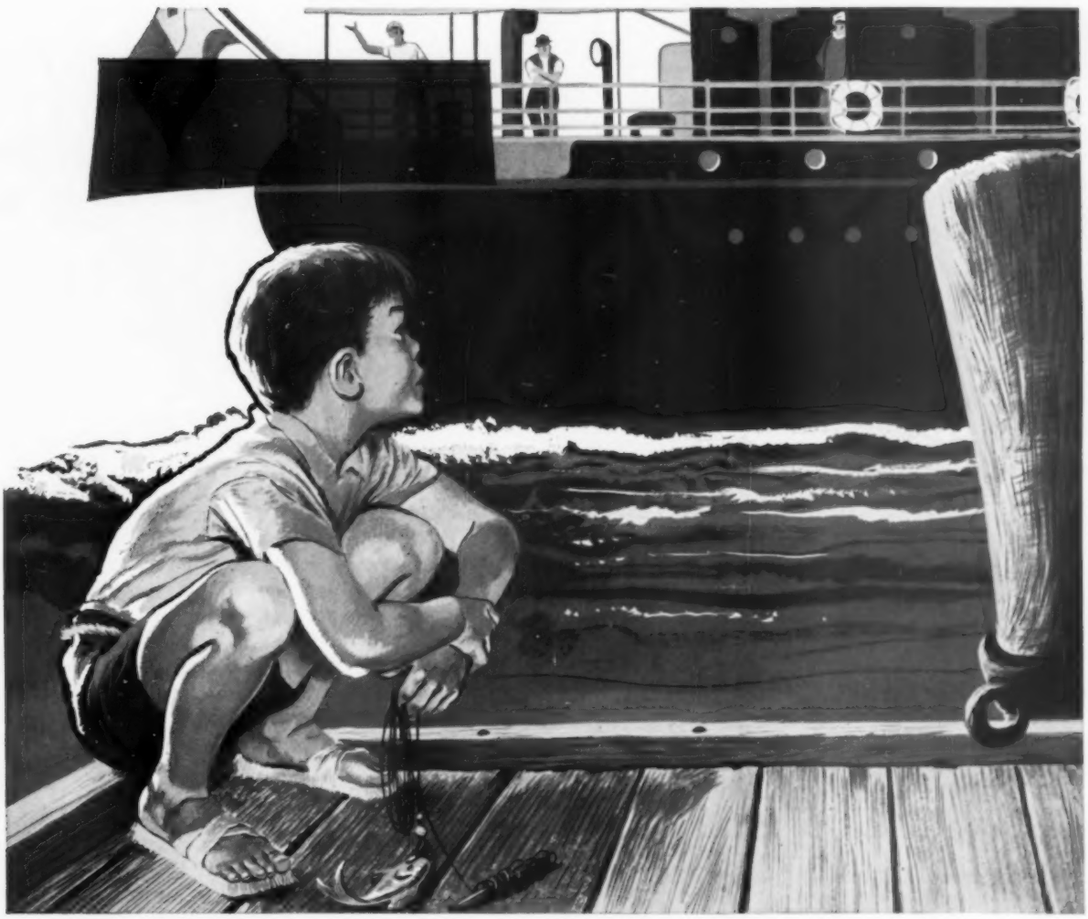

a cargo of hope for him

This is a special kind of ship, and it meets a special kind of need. It is the need you see everywhere these days throughout Asia, Africa and the lands of the Pacific – the demand for power machines to do work better and faster.

Throughout this vast area Standard-Vacuum tankers are plowing the seas as you read this, deep-laden with the petroleum required for new industry. Stanvac finds the oil, transports it, refines it and gets it to those who want it – all within the area where Stanvac operates.

These peoples are resolved to build a new kind of life for themselves and their children. Today they dream of food and clothing and shelter enough for everybody. And Stanvac is doing its best to help them make that dream come true.

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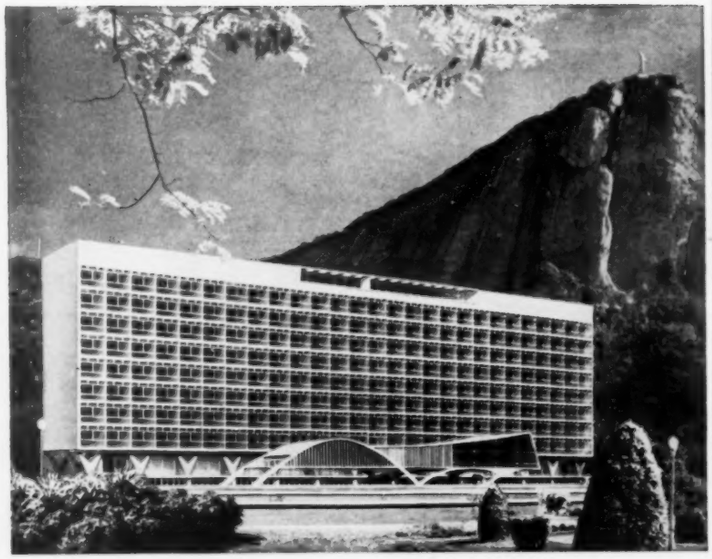


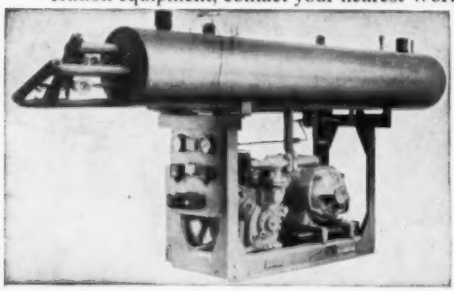
Brazil's new 10-story hospital

to be air conditioned by Worthington

Nestled at the base of Rio de Janeiro's famed Mount Corcovado and overlooking Lake Rodrigo de Freitas, the new Hospital Sul America will be one of the most modern hospitals in the world when it is completed in December, 1957. And it will use the world's most dependable air conditioning—Worthington.

The Worthington air conditioning and refrigeration equipment used in this all-glass and concrete structure includes: 3 Packaged Chillers driven by 40 hp motors; 3 evaporative condensers; 6 air handling units and 45 under-the-window type conditioners. The Worthington equipment will air condition the 7th, 8th, 9th and 10th floors where the operating room, maternity ward and deluxe apartments are located. Installed by Ceibrasil, Worthington equipment was chosen because of its flexibility, economical performance and dependability under all conditions.

For additional information on Worthington air conditioning and refrigeration equipment, contact your nearest Worthington representative or write to: Worthington Corporation, Department O.C., Harrison, N. J., U.S.A. A 57-1E



Three Packaged Chillers of this design will help air condition the Hospital Sul America.

WORTHINGTON

The sign of value around the world

By Joseph B. Huttlinger

President Eisenhower, who three times asked for legislation to ease up federal price and other controls over natural-gas producers, is now regarded a lukewarm supporter. The President, whose views may be decisive, asked for legislation through a cabinet committee report in 1955; again in February of 1956 when he vetoed the gas measure which reached him; and early this year in his budget message to the Congress. Along the lines the President suggested, identical bills were introduced in April by Representative Oren Harris (D., Ark.) and Representative Joseph P. O'Hara (R., Minn.), both of the House Commerce Committee. They expected White House support.

Instead, the President sent word to Congress, through Charles Kendall, counsel of the Office of Defense Mobilization, that he wants two major amendments to the Harris-O'Hara measure. One would allow the Federal Power Commission to use "costs" in setting prices of natural gas in the field. The other would allow the FPC to change existing contracts when based on routine and usual escalator provisions. Natural-gas producers, who were not too happy anyway about the Harris-O'Hara measure, thought the two changes would make it "meaningless," and "totally unacceptable." Thus, the prospect is that only if the White House backs down on one amendment, or both, can there be a gas bill. Chairman Harris, of the commerce committee, is ready to table the "costs" amendment if the White House will back down on the escalation one.

Anti-trust Spotlighted

The American petroleum industry continues as the No. 1 concern of the antitrust division of the US Department of Justice. The USA is unique in the vigor with which it enforces laws forbidding agreements on prices, markets, supply, and the like among industries. The oil industry, above all, must be Simon pure on these counts, for oil is constantly the center of DJ attention. One reason is that oil is a large industry; another that everyone is interested in the price of gasoline, for everyone uses it. As a result, action in this field gets attention from the people, and all governments like attention.

Here's a roundup of activities:

At Philadelphia, DJ accused Sun Oil Co. in 1950 of forcing its dealers to handle Sun gasoline, motor oils, and greases exclusively. This, said DJ, is contrary to the antitrust laws. Now the DJ has filed brief, asking an end to the alleged practice. Sun Oil is filing a reply brief; final arguments are due this autumn, and a decision may come by Christmas.

PIPE LINE

On the West Coast, seven oil companies are accused of actions in restraint of trade, and DJ is asking correction—including a ban against the majors operating at retail. The case is far from the end of the road, however. It is, perhaps, of more moment than the Sun case.

Further, the courts are hearing testimony about the price charged by certain major oil companies in the Middle East to the USA government for oil supplied to the foreign-aid program. In addition, the government's suit against an alleged "oil cartel" of international oil companies is still on the books, and could become active.

Fair Trade Still Pending

Other petroleum antitrust matters have brought some decisions recently, but appeals and the like are being filed. In the field of "fair trade" pricing of gasoline, there are cases involving Esso Standard Oil Co. and Socony Mobil Oil Co. Inc. In the one, Esso brought suit against a dealer, Secatori's Inc., on grounds the dealer refused to post the retail price suggested by Esso. Under fair-trade laws, the manufacturer may suggest the retail, resale price, in many instances, and be exempt from the antitrust laws. This has been used in New Jersey and elsewhere to help end gasoline price wars. The US District Court at Boston, however, ruled against Esso. The court said Esso sells to commercial accounts, as does the dealer, and thus the fair-trade exemption does not apply. Esso appealed to the court of appeals, and lost. Now, it is going to the supreme court.

Socony was accused by the DJ of fixing gasoline prices at Boston. Socony said it was innocent, and that all it was doing was "fair-trading" gasoline. The DJ said there was more to it than this and, DJ said in a 70-page brief, gasoline may not come under the fair-trade laws anyway. The reason is, said DJ, that gasoline is not sold in a container which bears a trademark. The judge, however, agreed with Socony, and found the company innocent. DJ is appealing, and the case heads for the supreme court.

The Texas Co., meanwhile, figures in another case before the supreme court—where the question is whether the subsidies, rebates, and the like given gasoline dealers in price wars are illegal. Enterprise Industries Inc., a former dealer of Texaco at Wethersfield, Conn., filed the action, and won in the US District Court. Enterprise lost in the circuit court, and appealed to the supreme court.

Further, the Federal Trade Commission has brought cases against Sun Oil Co. at Jacksonville, Fla., and The Pure Oil Co. at Birmingham, Ala. Here, price-war aid to gasoline dealers is at stake; and the FTC decisions, which are to come, may spell out what kind of price-war subsidies are legal.

Here is a new full-revolving, stationary-mounted crane — the UNIT Mariner — specially designed for off-shore drilling operations. Conceived, developed and perfected by UNIT, the Mariner meets all requirements for cargo handling from a fixed mounting as applied to ships, barges or off-shore platforms. Unlike conventional cranes, the Mariner emphasizes unusual strength in turntable, roller path, rollers, hook shoes, boom and hoist mechanism.

A special, heavy-duty "A" frame permits capacity loads with extended boom at long radius. The famous UNIT sealed cast gear case serves as a protection against salt spray.

SAFETY is a major feature. Incorporated in the Mariner design, are positive and mechanical boom stops. These boom stops control the angle of elevation and prevent the boom from whipping back. Also the safety-promoting Full Vision Cab enables the operator to see what he is doing at all times. Load ratings are based on high factors of safety.

Yes, the Mariner is designed primarily for your type of cargo handling. Get the facts. Send for bulletin — NOW.

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* *VAL is valvulinella one of the micro fossils in the oil bearing Jurassic rocks. The other fossil shown is Orbitolina. Ammonite is in background.*

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ROGERS' CREWS GO EVERYWHERE

CB&I Reactor-Stripper Starts Japan Journey

CB&I reactor and stripper being removed for loading on SS President Harrison of American President Lines. Reactor is 13 feet 8 inches in diameter, stripper is 6 feet 8 inches in diameter.

This 50-ft. long reactor and its traveling companion, a 37-ft. stripper are part of a shipment of CB&I-fabricated structures furnished for a Japanese oil refinery. The vessels were furnished through the Universal Oil Products Company for Idemitsu Kosan Ltd., Tokuyama, Japan.

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P-56

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Canadian Notes

Ontario Line To Have 4 Sections

Northern Ontario Pipe Line Crown Corp. will have four sections on its 30-in. natural-gas pipe line from the Manitoba-Ontario border to Port Arthur, Ont. Selected tenders were called for April 26, closing date, from about 10 contractors. Pipe delivery dates were still indefinite. Line will be leased to Trans-Canada Pipe Lines Ltd., when completed.

Pincher Creek Diversion Questioned

There is renewed speculation over question of whether the Pincher Creek gas field in southern Alberta will be diverted from supplying Trans-Canada pipeline to possible export south along lines first proposed in 1949. Presence of one other major field in area (Savanna Creek) and new Shell discovery at Waterton Lake suggest economic coordination of three fields. Meanwhile, greatly increased reserves of gas in central and east Alberta are nearer to Trans-Canada terminal.

Saskatchewan To Get Alberta Gas

Saskatchewan will get half a trillion cubic feet of eastern Alberta natural gas from the Many Island field under permit from the Alberta government, following recommendation of the conservation board. The decision, announced April 3, is of utmost importance for Saskatchewan Power Corp., which will start at once on a project to pipe gas from joint development of Many Island field and the Hatton gas field on the Saskatchewan side of the boundary. Total volume in combined fields is 895 trillion cubic feet.

Gas-Sulfur Plant For Okotoks Field

Construction of a natural-gas and sulfur-extraction plant in the Okotoks gas field near Calgary is planned by Shell Oil Co. if agreement can be reached with other operators for unitization of the field. Agreements must be reached with landowners in the area also. Negotiations have been under way. Shell officials estimate that natural-gas production probably would average 30 million cubic feet daily. At this rate, 300 tons daily of sulfur could be produced.

Alberta Oil-Sands Area Defined

Given its first definition by statute, the oil-sands area in northeastern Alberta will be officially considered an 11,340-square-mile area under an amendment to Alberta's mines and minerals act. Center of this area, comprised of 315 townships totaling 36 square miles, is about 50 miles north of the town of McMurray, approximately 200 miles northeast of Edmonton. Area of oil-bearing sands previously had been estimated over a widely divergent range from 1,500 to 30,000 square miles. The sands still are believed to contain the same amount of oil as previously estimated—from 100 billion to 300 billion barrels. Officials say the definition of the area is necessary for purposes of simplification in granting leases.

Phillips-Pacific Petroleums Refining

Phillips Petroleum, Bartlesville, Okla., is teaming with Pacific Petroleums Ltd., Vancouver, B.C., in ownership and operatioin of refineries in the gas-producing Peace River block of British Columbia. Announcement was made that Pacific has sold an interest in its Dawson Creek refineries to Phillips. Phillips later will take a leading part in handling all liquid products from new refineries and scrubbing plants at Taylor, B.C. Under the agreement, Phillips' well-known "66" brand will be adopted as a trademark. The company was a pioneer in the search for oil and gas in the Peace River block.

Saskatchewan To Tax Property Value

The Saskatchewan government plans a new system of taxation for producing oil and natural-gas properties in the province. Under this system, these properties would be brounght under the system now affecting only coal-producing areas. The tax would be fixed in relation to the value of the property and not exceed 10 mills on the dollar. Under the old system, a mill rate was assessed on the value of minerals, or a flat rate of 50 cents an acre was imposed in a producing area. The exact amount of the new assessment has not been given, but, even if the maximum rate is imposed, it is not believed it will not be "unduly burdensome."

Search In Quebec Progresses

Imperial Oil Ltd. has announced its fourth wildcat in the search for oil and gas along the eastern St. Lawrence. The well will be drilled near Vercheres on the south side of the river, 20 miles below Montreal. Lowlands Exploration Co., Imperial subsidiary, will carry out the operations. Lending strong encouragement to exploratory efforts in the area was a recent discovery by Bald Mountain Oil, holders of a 373,200-acre concession extending along the St. Lawrence River's north shore. Metered at a production rate of 3.5 mmcf per day, the well was brought in near Batiscan, Que., below Montreal on the north shore of the St. Lawrence.

Prospecting along the St. Lawrence dates back 80 years.

New Canadian Line

An application for construction of a multimillion dollar pipeline from Dawson Creek in northeastern British Columbia to tidewater, probably at Bella Coola, B.C., has been filed with the B.C. government by Act Oils Ltd., an affiliate of Canada Southern Petroleum Ltd., Calgary. Officials of Canada Southern, one of the chief backers of the project, stated that Dutton-Williams has been engaged to survey a route for the line. Its size will be determined after reserves have been established.

Record Saskatchewan Lease Sales

Saskatchewan government received $4,199,086 in cash bonus bids for lease parcels in Crown reserve sale on April 9, largest sale to that date. The 1957 revenue to that date was $9,366,411 from three sales, and the all-time cumulative since the beginning of 1956 was $17,599,281. There were no sales before 1956.

Monthly Completions Top 300

March well completions in western Canada numbered 304 which finished drilling—a new record for March. Previous record was 248 completions in 1956. Alberta led with 151, and Saskatchewan was a close second with 121. Wildcats set a new high record of 82—greater than any previous month. The first quarter total was 775 wells, compared to 670 in same period of 1956.

West Coast Exports High

West Coast exports of Canadian crude remain high —with Trans Mountain Oil Pipe Line Co. having scheduled 200,000 b/d deliveries average for April and May. In March the line carried 190,794 b/d average.

Vancouver To Boost Refinery Capacity

Vancouver's petroleum producing capacity will be boosted by addition of a fourth refinery which will be built by British American Oil Co. on a 400-acre site near Port Moody. Preliminary construction was started on the $20 million 20,000 b/d refinery in April. Completion will be in 1958. The B-A refinery will be built by Canadian Kellogg Co. Ltd.

B-A oil entered the petroleum industry in B.C. in 1945, when it acquired the interests of Union Oil of Canada in the province. Today it has 550 service stations and dealers throughout the province. Facilities at the new installation will include topping and vacuum, catalytic cracking and catalytic reforming, and alkylation units.

New Alberta Crude Line

The next minor Alberta pipeline construction project will be a small crude line for the Willesden Green and Alhambra fields south of Pembina. If recent Amerada Crown reserve purchases are productive at south end of Willesden Green Cardium sand field, potential will justify pipeline, with probable destination Pembina pipeline terminal at east end of Pemina field. Initial throughput will be about 2,000 b/d to 3,000 b/d.

Saskatchewan Development Up 50%

Development wells in southeastern Saskatchewan can be expected to dominate drilling in western Canada all year. First quarter showed Saskatchewan up 50% over same period of 1956, with 229 wells, while Alberta was down 20% with 281. Saskatchewan development wells are situated 95% in southeast Mississippian sector, which should exceed 1,000 completions this year.

Mobil Has Conservation Program

Mobil Oil of Canada Ltd. has announced plans for launching in Alberta's Pembina field "the largest pattern-flood conservation project ever undertaken by one company." Scheme is said to involve an eventual 40,000 acres and expected to provide a minimum threefold increase in ultimate oil recovery. The company has newly placed its 500th Pembina oil well on production, and this well will be converted as a water-injection well in the conservation program.

Husky Sells Savanna Creek Gas

Canadian Husky Oil Ltd. dedicates its 32½ interest in southwestern Alberta's Savanna Creek gas field to Westcoast Transmission Co. under arrangements with Westcoast and El Paso Natural Co. Announcement was made in Calgary by Husky president Glenn E. Nielson at the annual general meeting of Husky shareholders. Mr. Nielson announced further that El Paso has purchased $3 million Husky shares out of a private placement of $5.5 million common shares taken by institutional and corporate investors.

Northern Ontario PL Reports

The Northern Ontario Pipe Line Crown Corp. of Canada has issued a report covering its operations from June 7, 1956 to December 31, 1956, and the publication will be supplied free on request. This is called its first annual report.

Alberta Considers Compulsory Unitization

The Alberta government plans compulsory unitization of oil and gas fields in the province when this action is considered to be in the public interest and operators cannot reach agreement for voluntary unitization. Legislation toward this end has been introduced as a revision to the Oil and Gas Conservation Act. The bill would enable the cabinet to proclaim unitization of any field in the province when it and the Alberta Petroleum and Natural Gas Conservation Board felt unitization was "in the public interest." This public interest would be decided through conservation-board hearings on applications made by owners to the board for compulsory unitization. It was pointed out that similar unitization regulations are in effect in some states in the USA.

Canadian Oils To Expand Facilities

Canadian Oil Companies Ltd. reports that its manufacturing facilities may be expanded as result of increased sales of its petroleum products. These sales increased 15% during the first quarter of 1957 alone. At this rate of growth, the company is gradually outstripping its manufacturing facilities which were built a few years ago. It is possible that further expansion will be undertaken before too long.

Ethyl research gains new insight into the spark plug fouling problem

It's been evident for some years that trends in engine design, as well as trends in urban and suburban traffic patterns are intensifying the problem of spark plug fouling in passenger cars.

In the process of developing additives to help combat this problem, it became obvious to Ethyl engineers that previous laboratory methods for detecting and measuring spark plug misfire were inadequate. So Ethyl engineers created their own instrumentation shown below.

This Misfire Recorder accurately detects misfiring and records spark plug shunt resistance during a rating test. Pressure pulses in the exhaust system due to misfiring are picked up by a transducer, relayed to the instrument. Plug resistance is measured by a built-in megohmmeter.

This type of instrument was first applied to the detection of spark plug misfiring by Ethyl Research Laboratories. It has proved so satisfactory that many leading petroleum and automotive companies are now using the same instrumentation in their own laboratories.

How Ethyl research can help you

Because of its extremely close relationship with both the Petroleum and Automotive Industries over the years, Ethyl Corporation has been able to channel much of its research effort into projects of unusual interest and importance to both industries.

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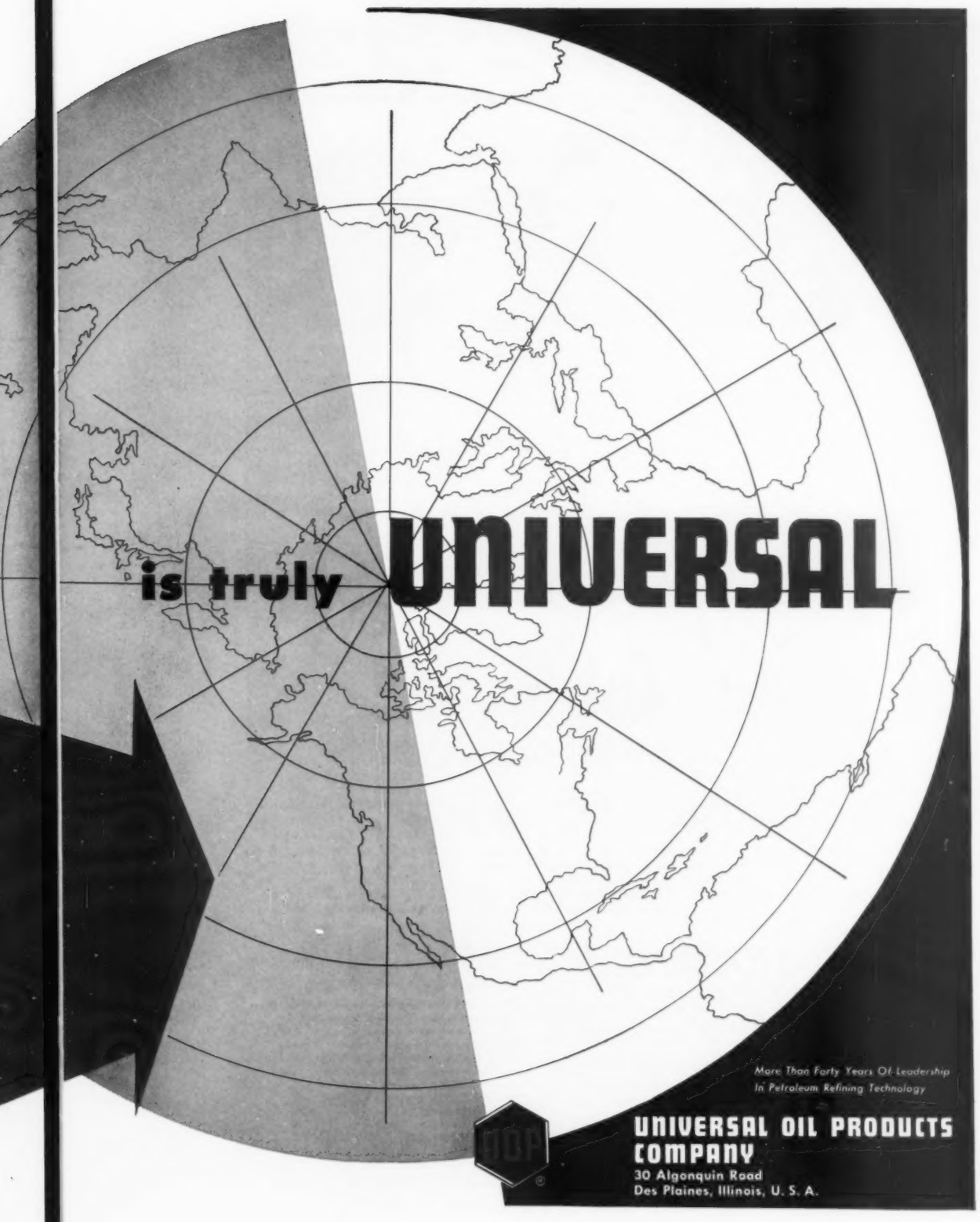
Today, refiners everywhere in the free world are users of this laboratory service. It is available to any refiner, regardless of his volume or scope of operation. UOP laboratory service is truly universal.

UOP laboratory service

UOP Laboratories have available the most modern scientific research equipment. For example, here is one of two mass spectrometers, both of which are used for checking compositions of gas and liquids for laboratory customers. In actual operation the gas molecule is bombarded by electrons under carefully controlled conditions. Resulting fragments are sorted out by electric and magnetic fields, and recorded, thus revealing a pattern characteristic of each gas.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In Petroleum Refining Technology
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How Standard put $4,282,372 to work every day last year

. . . and what this meant to people in the Western Hemisphere

Port of Spain, Trinidad Exploration for possible new sources of oil covered millions of acres in the U.S., Central and S. America, Canada, Alaska and Bahama Is. Seeking oil for your future use is one of our biggest expenditures . . . $324,789 on an average day. In 1956 we found more new oil than our wells pumped from the ground.

Gulf of Mexico We completed better than two new wells a day . . . 101 off the Gulf Coast where drilling costs up to six times as much as on land. An average day's drilling bill came to $431,516. This huge sum was necessary because a well may cost from $125,000 to over $1,000,000 and one out of every six drilled was a dry hole.

Vancouver, B. C. On an average day Standard spent $517,446 to keep equipment in repair and up to date . . . extending a wharf at Vancouver or a pipe line to Boise, Idaho. This work provided employment for thousands of construction and maintenance workers as well as for the employees of the firms supplying equipment.

El Paso, Texas Purchases of crude oil took $949,853 a day in areas such as El Paso, Texas and Bakersfield, California. Although our own Western Hemisphere production was at a new high, we bought oil from many small and medium sized producers. To these people Standard was a good customer and an important source of income.

Salt Lake City, Utah Our 738 employees in Utah were among the total 38,854 who participated in benefit plans at the rate of $119,082 a day. Under our Stock Purchase Plan, Standard added nearly twice the amount an employee deposited. Other plans included sickness benefits, retirement pay and Company-paid life insurance.

Bajo Grande, Venezuela Increasing refinery output and improving products are never-ending jobs. Last year one of our operating companies completed a new asphalt refinery in Venezuela and plans were announced for a future refinery in Washington. New equipment for our manufacturing plants cost $107,741 a day.

U. S. A. Our Federal, State and other taxes amounted to $325,424 a day . . . enough to buy a helicopter for rescue work, or pay for complete training of three jet pilots every day. In 1956 Standard also collected for and passed on to Municipal, Provincial, State and Federal agencies $193,460,383 as sales and gasoline taxes.

Berkeley, Calif. Although 43.5% of Standard's owners live in the West, Alaska, and Hawaii, you'll find them almost everywhere. Stockholders include colleges, churches and banks, but most are individuals. Of every dollar we took in last year, 6-6/10¢ or $285,028 a day went to our 137,381 stockholders who own the Company.

WHAT HAPPENED TO THE $1,567,348,030 STANDARD TOOK IN LAST YEAR can best be told in terms of people . . . many people in many lands. For example, Standard was a customer of more than 10,000 Western firms last year. One major item such as a refinery unit required the services of people in scores of other industries.

Moreover, many of the 1250 products we made from petroleum were raw materials for other manufacturers . . . from paints to cosmetics, from detergents to synthetic fabrics. Thus you'd never be able to count the people who benefited directly or indirectly from the $4,282,372 Standard put to work every day last year.

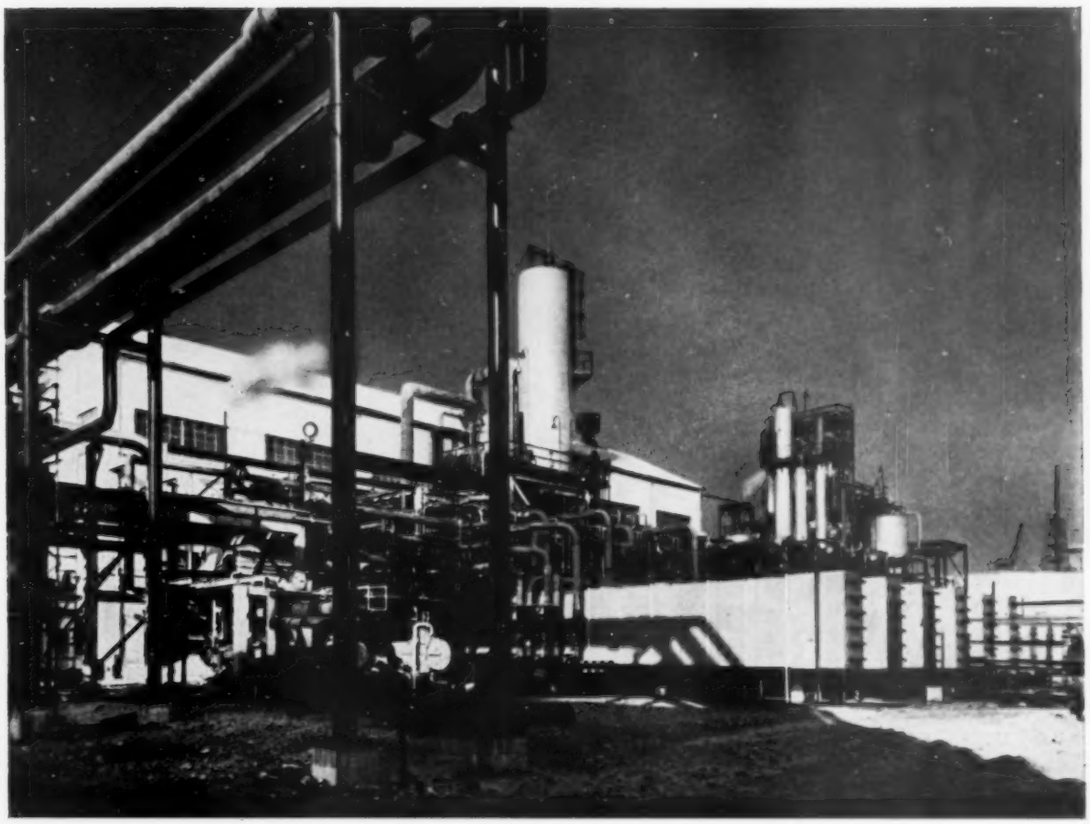
Through affiliated companies operating in the Eastern Hemisphere, Standard helped carry on expansion and development programs that provided better living for people in Europe, Africa, the Middle East and the Far East. For complete, interesting details write for a copy of our Annual Report: Standard Oil Company of California, Room 2153, 225 Bush Street, San Francisco 20, California.

STANDARD OIL COMPANY OF CALIFORNIA

plans ahead to serve you better

dewaxing-deoiling

... 5800 bbls/day



RECENTLY completed for a large Midwestern refiner, this modern MEK Dewaxing-Deoiling plant will process in blocked operation both waxy distillates for wax removal and oily waxes for oil extraction. It is designed to produce zero and lower pour point oils and waxes meeting trade oil content specifications. Foster Wheeler supplied process and mechanical design, engineering and construction.

Foster Wheeler's long experience in this specialized field is your best assurance of complete satisfaction, from initial planning to final installation and on-stream service. Foster Wheeler process design engineers offer more than 20 years of continuous and cumulative experience in lube oil manufacture. Their intimate knowledge of all phases of design, engineering and construction — plus their close relationship with all licensor companies — can save time, effort and expense in any expansion or modernization program. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

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Wrong Place to Cut Costs of a New Process Plant

When building a new process plant, engineering is the easiest place to cut investment costs. But it's the wrong place! The saving of a few hundred hours of engineering, or trying to buy engineering at a price, can cost thousands of extra hours of field labor and additional thousands of dollars for materials. Although the added cost of inadequate engineering seldom can be pin-pointed beforehand, it is inevitably reflected in the operating record of the plant.

Better engineering is the basis of The M. W. Kellogg Company's world-wide reputation both as engineers and builders of complete process plants and as consultants on various special engineering projects. This better engineering is the result of good engineers working in an atmosphere where sound engineering is the measure of success for both the individual and the organization.

To Kellogg's clients, better engineering means plants built at the lowest capital investment consistent with reasonable operating and maintenance costs.

M. W. Kellogg welcomes the opportunity to demonstrate how better engineering can benefit companies contemplating new process plants.

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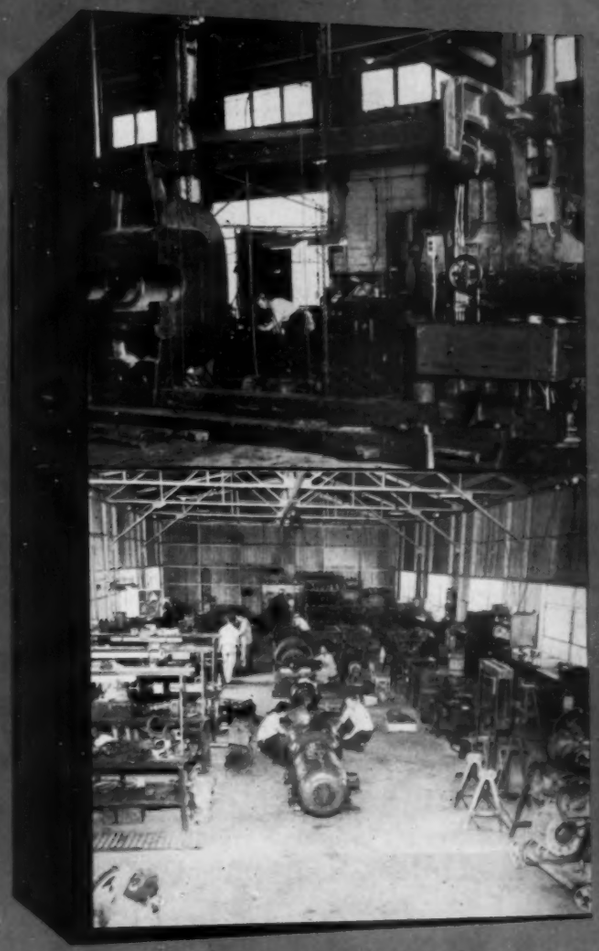
a name you know for "Special Oil Services" . . .



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A part of Avondale's growing diversification to meet the special requirements of the oil industry is reflected in their recently enlarged OIL TOOLS DEPARTMENT with the addition of a new Oil Field Machine Shop. Here the top combination of expert mechanics and modern machines makes it possible to offer fast and efficient service on all types of repair to oil tool drilling equipment . . . 24 hours a day, 7 days a week.

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Another Avondale service kept right up-to-the-minute to meet your special needs, this department is ready to meet your most exacting requirements in the electrical field. Motor rewinding is a specialty, but facilities are available for all types of electrical jobs. You will be pleased by the prompt turn-out of your work when you deal with Avondale.

. . . and many other "special services"—engineering, research, design, fabrication, conversion and, of course, all types of construction of oil marine equipment.

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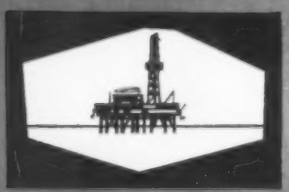

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TIDEWATER'S NEW SULFUR PLANT

The H_2S Sulfur Recovery Unit at Tidewater's Refinery, near Delaware City, is one of 37 by Parsons. It is the first ever designed to operate from one-quarter to full capacity.

Parsons is proud to have had a part in Tidewater's Refinery – which is capable of handling the widest range of crudes – the largest ever built at one time.

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DU PONT *Petroleum Chemicals* NEWS

One of a Series of Bulletins for the Petroleum Industry

JUNE 1957

World's first TEL tank-ship commissioned

NEW ASSISTANT REGIONAL MANAGER

WILLIAM W. WINGATE was recently appointed assistant regional manager in the Petroleum Chemicals Division's Mid-Continent Region, with headquarters in Tulsa, Oklahoma. He replaces Barrett B. Russell, III, who has been transferred to the Gulf Coast Region in a similar capacity.

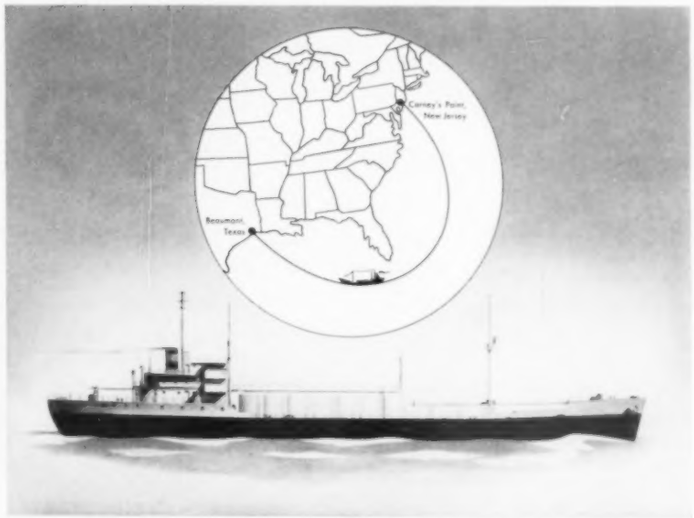
Previously Bill was active in regional sales and technical service work on all Du Pont additives other than tetraethyl lead. This includes Du Pont Estersil GT grease thickener, metal deactivators, lube and fuel oil additives, antioxidants, dyes and grease stabilizers.

Bill Wingate had an early introduction to the oil industry doing gasoline and lube oil testing for Socony-Mobil Oil Company, Inc. while earning his B.S. degree in chemical engineering at the University of Pennsylvania.

During World War II, Wingate was a lieutenant in the Navy and spent three years on submarine duty with the Pacific Fleet.

He is a member of Sigma Xi and Tau Beta Pi.

Rebuilt ship brings convenient Du Pont TEL supply to Gulf Coast refining area



MV PETROCHEM – the first chemical carrier for overwater transport of bulk shipments of TEL antiknock compounds. Rebuilt for the exclusive use of Du Pont, the 6,000-ton tank-ship was recently put into service to meet the expanding needs of Gulf Coast refiners.

SHIP-SUPPLIED STORAGE AND DELIVERY TERMINAL AT BEAUMONT COMPLETED

Another important TEL delivery convenience for Gulf Coast refiners became a reality with the recent rechristening of the MV PETROCHEM – the first TEL tank-ship. This unique ship makes possible a major source of Du Pont TEL supply right in the Gulf Coast area.

Also, TEL handling facilities have been constructed at Beaumont, Texas. These will provide dock accommodations for the new ship, and storage and distribution facilities for its cargo. Thus, the Beaumont terminal is equipped to provide the same TEL-availability and delivery service as Du Pont's manufacturing plants at Carney's Point, New Jersey and Antioch, California.

Bulk shipments

MV PETROCHEM'S maiden voyage marked the first time tetraethyl lead compounds have been transported over water in bulk. To accomplish this safely, the tanker was redesigned and rebuilt, from the hull up, to rigid Du Pont specifica-

OVER

DU PONT *Petroleum Chemicals* NEWS

Diesel locomotive fuel problem solved with Du Pont additive

R. R. SHOP SUPERINTENDENT:
Incompatible economy diesel fuels are causing injector-sticking and filter-plugging that cost us plenty in time and money.

OIL SALESMAN:
We've been hearing that lately. Incompatibility *is* the problem – but there's a way to solve it. I'll tell the refinery about it.

REFINERY EXECUTIVE:
Yes, I've been reading your ads telling how Du Pont's FOA-2 helps eliminate most diesel fuel incompatibility troubles. What about it?

DU PONT REPRESENTATIVE:
That's right, it does! Here, let me show you our data. I'll show your customer, too.

R. R. SHOP SUPERINTENDENT:
This injector's clean as a whistle—and it's been in operation 35 days.

DU PONT REPRESENTATIVE:
In most cases Du Pont FOA-2 keeps fuel oils gum-free. And while it helps prevent injector-sticking, filter-plugging it does not contribute to sparking tendency, because it burns without ash.

CONTINUED

Tanker shipments

tions—so rigid, in fact, that the PETROCHEM meets or exceeds the requirements of any port authority in the world!

TEL to Texas — raw materials back

The converted ship is in reality a two-cargo vessel. Designed primarily to move bulk shipments of TEL south from Carney's Point, it is also equipped with separate tanks for transporting ethyl chloride and ethylene dichloride back to Carney's Point.

Safety for crew and cargo

The PETROCHEM is permanently compartmented, with solid bulkheads dividing the operational and cargo sections. Still other solid bulkheads – welded to the hull itself—separate each of three cargo spaces. Safety and product cleanliness were the primary design considerations.

Unique features

Many new safety features were specially designed for this 6,000-ton tankship. Each compartment is ventilated separately by a system which effects a complete change of air throughout the entire ship every three minutes. A vacuum system is another of the many special facilities for safe maintenance, repair, and product handling.

If you operate a refinery in the Gulf Coast area, the new ship and terminal are your assurance of a nearby ample supply of Du Pont TEL.

Voice of America to broadcast Magic Barrel excerpts

Parts of the oil industry's "Magic Barrel" presentation have been recorded for broadcasting to people behind the iron and bamboo curtains as well as in free countries of the world.

Members of the Voice of America staff first became acquainted with the Du Pont-designed Magic Barrel when visiting the company to develop a special program using the voices of approximately 100 foreign-born and native American Du Pont employees. At this time, the Magic Barrel was shown to the Voice staff to acquaint them with the group of Du Pont products made from oil. They saw in this presentation some of the fruits of American enterprise – presented in a dramatic and convincing fashion. So they asked to have parts of it taped for broadcasting to their listeners.

The Magic Barrel broadcast has been included in a more comprehensive program in 32 languages under the title, "The People's Capitalism."

This program will also explain the widespread sharing of benefits under the American economic system and tell some of the history of the Du Pont Company. Recorded interviews with employees who emigrated from 44 foreign countries will appear on the program, along with company executives, scientists and union representatives. The interviews were all spontaneous . . . no prepared scripts.

The Voice of America program is the first concerted effort to tell the story of an American company in many languages.

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OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

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New Golden Jubilee Deluxe Pickup
—the longest body in its class!
Also, pickup with standard body and cab.

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New A-Line models range from pickups to 33,000 lbs. GVW 6-wheelers. Other International V and R-Line models to 90,000 lbs. GVW. Gasoline, diesel, six and V-eight engines according to models.

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They're *action* styled with new, straight-as-an-arrow functional lines that set a new style pace in appearance, comfort and handling.

They're powered by new engines that deliver more *usable* horsepower—including the most powerful "six" available in its field! They have exclusive new cab mountings for a quieter, smoother ride. New brakes, new steering, new frames are only part of a long list of new features, from bumper to tail light.

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From the standpoint of seismic prospecting, the Delaware Basin has always fallen under the category of a "poor" to "no-record" area. As a result, much of it remains unexplored.

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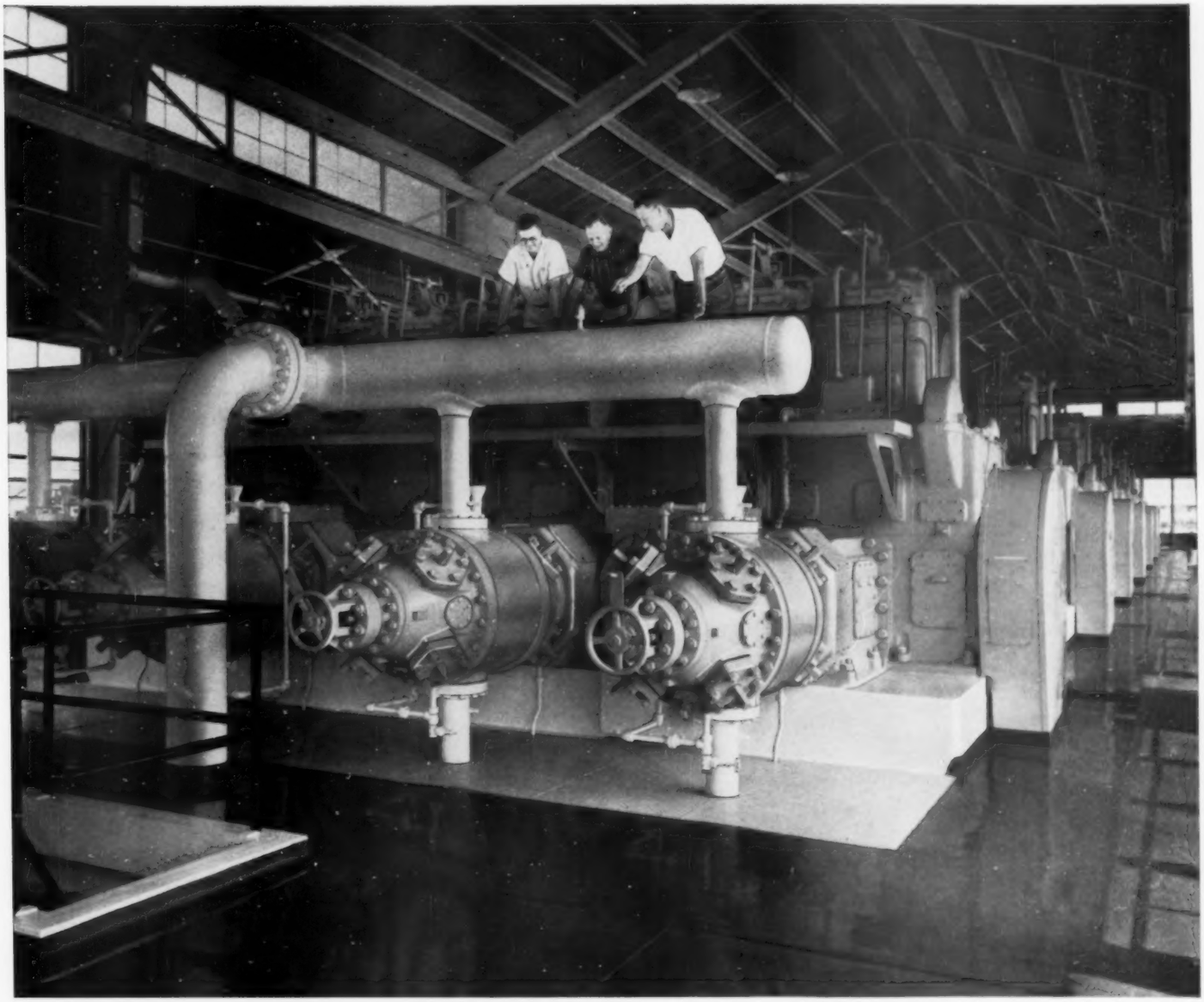


Richard N. Rogers, Results Engineer (left), W. C. Drienhofer, Station Superintendent, and R. A. Cuyler, Jr., Gulf Sales Engineer, inspect one of the 31 units lubricated by Gulf Security since 1944.

At Tennessee Gas Transmission Company's Middleton Station...

Not a ring change in 26,800 hours with

GULF SECURITY OIL

Thirty-one gas engine compressor units have been running smoothly at the Middleton Station with Gulf Security Oil since 1944. The records show 26,800 hours operation without a single ring change. And after 85,000 hours, Security in the crankcase was still in excellent condition.

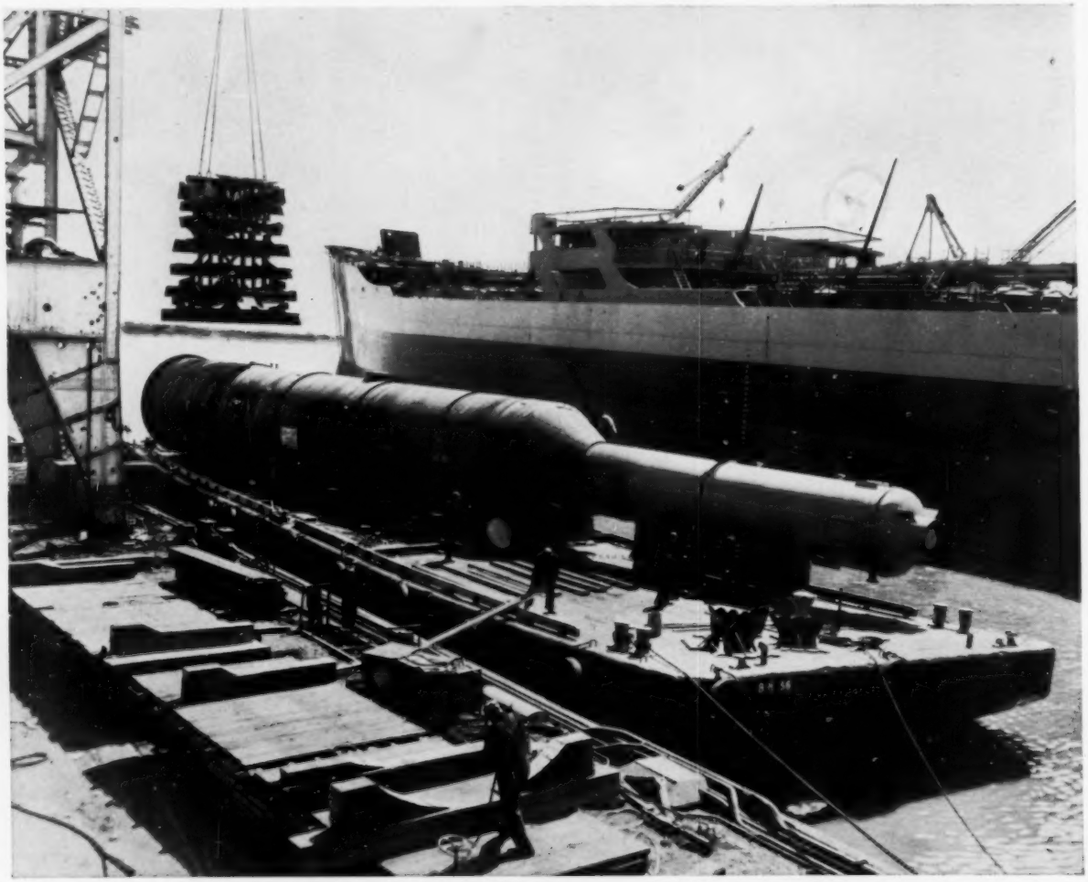
Here for 13 years Gulf Security has lived up to its name—security against operating troubles and high maintenance costs. Gas engine compressor units lubricated with Gulf Security are consistently free of heavy port and ring belt deposits. Wear is negligible—in fact, ring and liner life in both power and compressor cylinders is well above average. Bearings last longer, too.

When you use a Gulf product you get an extra dividend—the free services of an experienced Gulf engineer. He's always "on call" to assist you with any problem involving lubricants, fuels, or any other petroleum product. He can help you find opportunities to cut costs. Write, wire or phone your nearest Gulf office.

GULF

GULF OIL CORPORATION

1822 Gulf Building
Pittsburgh 30, Pa.



standard procedure: VERSATILITY . . .

The variety of work which Sun Ship's integrated shops produce for use by industries on land and sea brings a matching variety of shipping problems.

Our facilities for tidewater shipment are used to economical advantage on many of the massive structures that go into the making of the nation's petroleum and chemical industries. The barge shipment of tower and shed row baffles, shown above, is a good example.

And of course—when shipment by land is necessary—Sun Ship rigging and routing find the ways and means to handle such items as large-diameter columns by rail and truck.

It's all a part of the versatility which forty years' experience has made part of "standard procedure" in service of its customers.

Our Sales Engineering Department would be glad to use its experience in helping you overcome any problem of construction or shipment that faces you. Write

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SHIPBUILDING & DRY DOCK COMPANY

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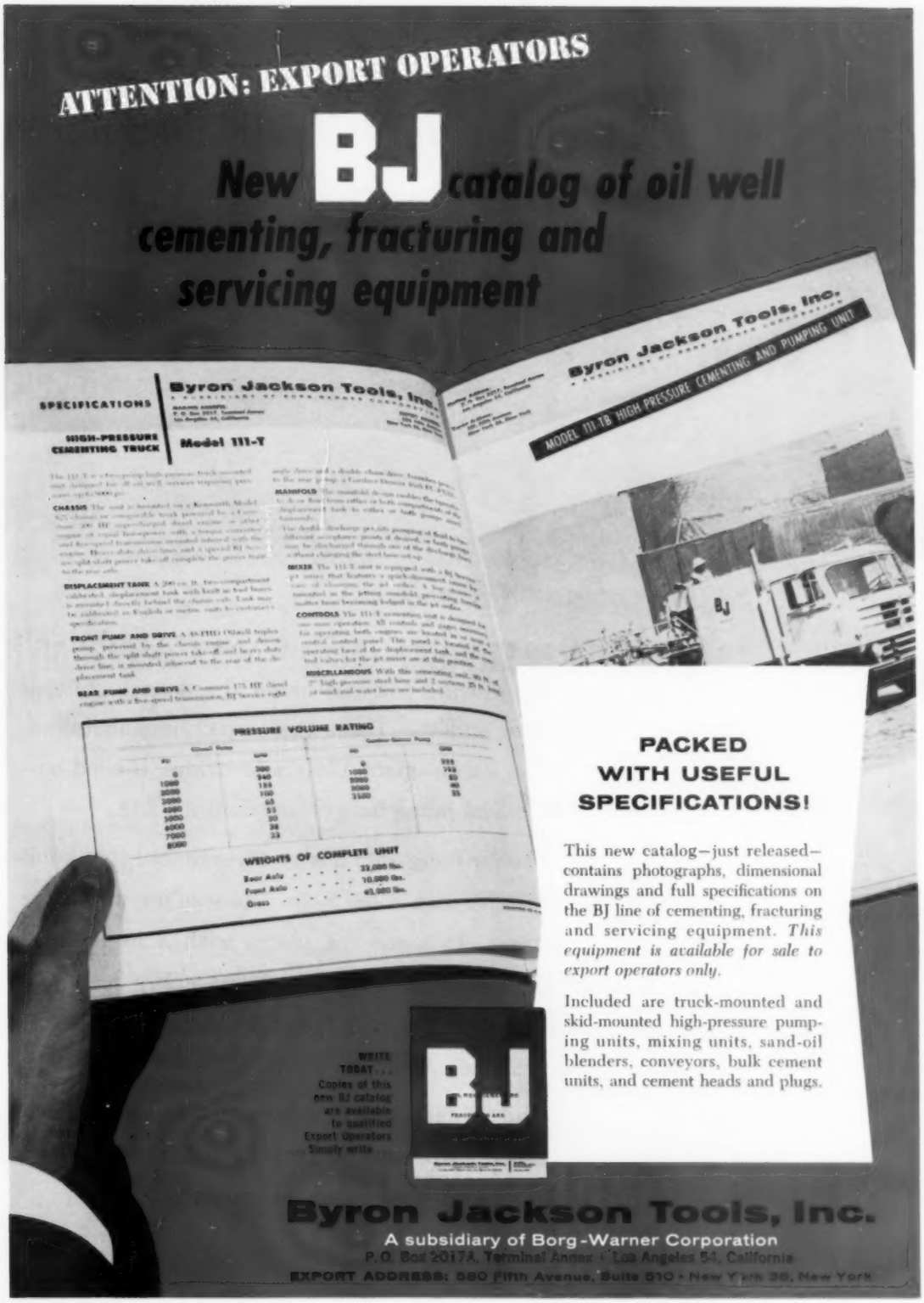
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PACKED WITH USEFUL SPECIFICATIONS!
This new catalog—just released—contains photographs, dimensional drawings and full specifications on the BJ line of cementing, fracturing and servicing equipment. This equipment is available for sale to export operators only.
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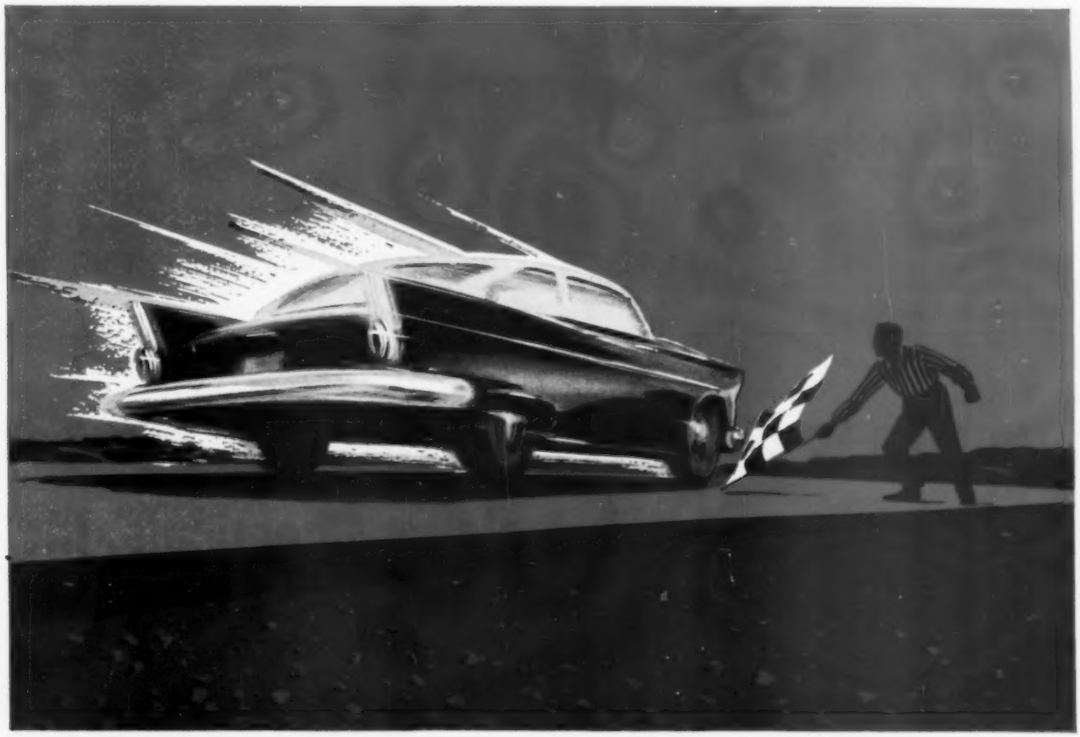

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a new Catforming catalyst

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Atlantic is proud to offer an advanced Catforming catalyst designed to economically produce higher octane gasolines . . . *and it can be utilized in your present equipment.* For more information, write, wire or call The Atlantic Refining Company, P. O. Box 8138, Philadelphia 1, Pennsylvania.

Higher gasoline octanes through Pentafining

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ATLANTIC

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385 Madison Avenue New York 17, N. Y.

Lummus to Build 200,000,000 lb. per Year Ethylene Plant for Petroleum Chemicals, Inc.

Installation Designed for 50% Expansion

The Lummus Company is presently designing and will build for Petroleum Chemicals, Inc. at Lake Charles, Louisiana a plant to produce 200,000,000 pounds per year of ethylene. Scheduled for completion by the end of 1957, the plant is designed to permit expansion of output to 300,000,000 pounds.

The plant will use Lummus' ethylene process and will draw refinery gases supplemented with LPG from the nearby refineries of Cities Service and Continental Oil, by whom P.C.I. is jointly owned. Ethylene will be made in two grades — the top grade 99.8% pure — the second 98.5%. By-products will be 95% pure propylene, C_4s, and an aromatic distillate.

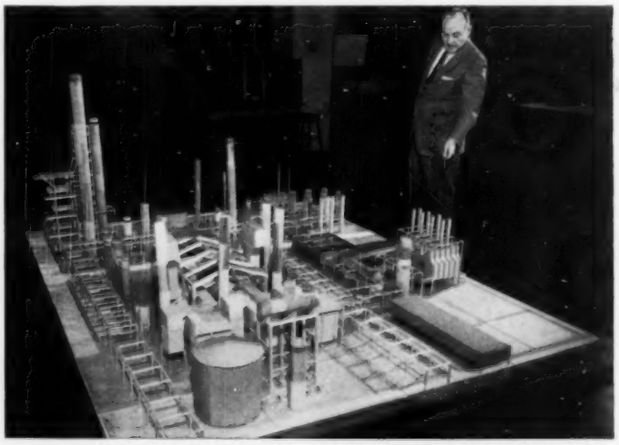
Cracking section of the plant features an improved Lummus heater which embodies years of research and development by Lummus' Heater Division. Equipment in the Lummus-designed low-temperature fractionation unit includes 12,500-hp gas turbines which drive the centrifugal charge and refrigeration compressors; exhaust from these turbines generates high-pressure steam in three waste heat boilers. The system utilizes high efficiency expanders to recover very low temperature refrigeration.

This plant brings the total of Lummus designed ethylene plants to 14, with a combined capacity of over 3 million pounds per day.

Part of the new plant's ethylene output will be sold to Calcasieu Chemical Corporation, which will use it to produce ethylene oxide and glycol in a plant adjacent to the ethylene unit. Lummus is currently designing and will build the Calcasieu installation.

Lummus has over half a century of experience with chemical and petrochemical projects. Why not discuss your next project with a Lummus representative.

THE LUMMUS COMPANY, 385 Madison Avenue, New York 17, N. Y. *Engineering and Sales Offices and Subsidiaries:* New York, Houston, Montreal, London, Paris, The Hague, Bombay. *Sales Offices:* Chicago, Caracas. *Heat Exchanger Plant:* Honesdale, Pa. *Engineering Center:* Newark, N. J.



Lummus engineer points out cracking heaters in model of Petroleum Chemicals, Inc. ethylene plant.

VOL. 28, NO. 6 JUNE, 1957

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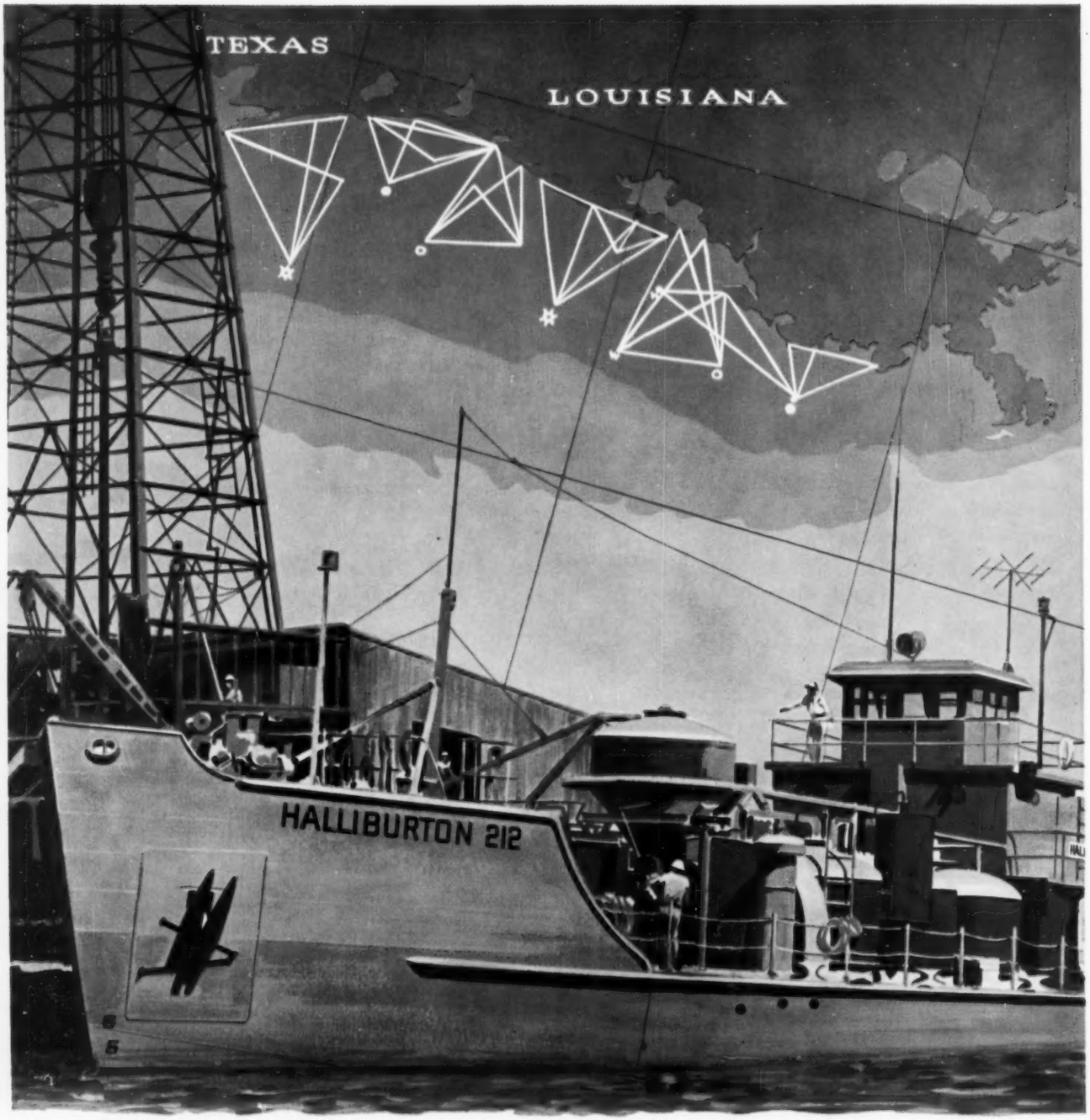
THIS MONTH'S COVER

Dawn in the Garland, Wyoming, field pictured by Tony Linck for The Ohio Oil Company. Color plates are reproduced through the courtesy of Eugene L. Price, editor of *The Beacon*, Ohio Oil's house magazine.



Down to the sea for oil

HALLIBURTON
OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

In the perpetual search for new fields to replenish America's sources of fuels and lubricants... more and more oilmen are seeking and developing offshore oil. Halliburton, too, guided by the policy of providing oil well services wherever they are needed, goes "down to the sea"... provides marine equipment, cements and methods to help Halliburton custo:ners surmount the obstacles raised by sea, swamp and lake... and safeguard production economically and efficiently offshore as well as on.

SEAGOING WELL SERVICES... A SHORT RUN FROM YOUR OFFSHORE RIG

Caveat Venditor

A lawsuit now in progress in the United States District Court in the city of New York cannot help but raise a serious question in the minds of management people in the petroleum industry as to conditions under which they are justified in selling oil or products during peacetime to a government agency. Is there a duty to make sales in time of peace if the seller cannot be sure that any sale may not result in costly litigation at some later date?

In the case in point, the Caltex group of companies supplied Middle East oil to Europe under conditions agreed to by the Economic Cooperation Administration. Originally priced at $2.03 per barrel, 36-gravity Saudi Arabian crude was later reduced to $1.75 per barrel—which price was specifically approved by the ECA in 1950. Two years later ECA changed its mind, decided it had been overcharged, and sued Caltex for $65.7 million—the entire selling price—or if that seemed too high, ECA asked a mere $36.8 million as a refund. Instead of standing by its bargain, or asking for a change in the contract while the oil was being delivered, ECA waited until the oil had all been consumed and then asked a refund of nearly a dollar a barrel—bringing the price of Saudi Arabian crude delivered in Europe to about 77 cents per barrel.

To support its position, ECA claims that the deal first was made on the basis of competition with Venezuela crude. Later, as Middle East oil became more plentiful, Venezuela crude became less competitive in Europe and Middle East crude was, in fact, shipped to the Western Hemisphere, it is stated. By calculating freight rates on oil from the Persian Gulf to various destinations and delivered prices for oil at these points, ECA has evolved a theory under which it hopes to have obtained some of its oil for nothing or a little less than nothing—all of it at less than the going market at time of delivery.

ECA specifically states that no "fraud or deceit" was involved on the part of the Caltex companies. It accepted delivery of the oil at an agreed price, but now wants its money back—having come to the belated conclusion that it was cheaper to produce oil in the Middle East than in Venezuela.

Caltex expects to prove to the court that its prices were the lowest market prices prevailing in Europe during the 1950-52 period; that the prices for Marshall Plan deliveries were as low or lower than those of any of its competitors. Caltex says it never knew of any prices being offered below its quotations, and that it lived up to the good-faith provisions of ECA regulations. The sale was "from a willing seller to a willing buyer in a market that was competitive in the extreme."

The government's position that Venezuela oil was no longer a factor in European markets in 1950-52 is not borne out by the facts. The record of ocean movements will show that the Western Hemisphere shipped 440,000 barrels more oil daily to the Eastern Hemisphere than it received from the East. Caribbean fields shipped 340,000 barrels of crude and products daily to Europe that year. There was, of course, some cross-hauling, as will always be the case in world markets; but the Carribbean was a factor in European markets throughout the ECA deal—and still is.

In the ordinary course of business where trading is at arm's length, the parties to a deal bargain until a mutually satisfactory arrangement is reached. Under the ancient principle of *caveat emptor,* the buyer assures himself that the goods purchased are satisfactory in quality and that the price is as low or lower than that offered by another. Once the sale has been made, deliveries may carry on for a fixed period or until one party becomes dissatisfied. Unless the product is substandard or fraud or deceit is shown, no closed transactions are reopened or made the basis of litigation.

When an "arm's length" sale is made to the government, without fraud or deceit, the rules appear to be different. Instead of *caveat emptor,* the Caltex case would seem to prove that, in dealings with the government, the phrase should be the converse: *caveat venditor!*

Loss of four floating rigs in USA coastal waters may increase offshore drilling costs by imposing new labor costs and higher insurance rates. Coast Guard asks authority to approve plans of new rigs.

The Mobile Rig Disasters

By James W. Calvert

If it can be said that the 10-year-old offshore oil industry in the Gulf of Mexico has made one important contribution to the science of drilling for oil and gas, it is in the successful use of the mobile floating rig, the "wildcatter" of the submerged oil fields.

This ungainly monster of the seas, which floats shiplike to a location and then is submerged to become an artificial island, has completed scores of wells out of sight of land, and has withstood storms of hurricane force; yet within the past two years four of these vessels have overturned with the loss of 13 lives and property damage in excess of $6 million. Elsewhere one $1,200,000 rig was badly wrecked in a sudden storm in the Persian Gulf, and several lives were lost.

Operators, marine architects, and builders have quickly come to the defense of the mobile units by arguing that they are perfectly stable and seaworthy under certain conditions and that human, rather than mechanical, error has been responsible for the four major rig disasters.

The consensus, particularly among those who design and build the seagoing drilling rigs and those responsible for their safety at sea, is that the oil industry should let seamen, not "landlubbers," handle the marine jobs.

They point to the successful and apparent routine operations of those drilling companies whose water transportation is directed by professional seamen or engineers with a basic knowledge of the sea.

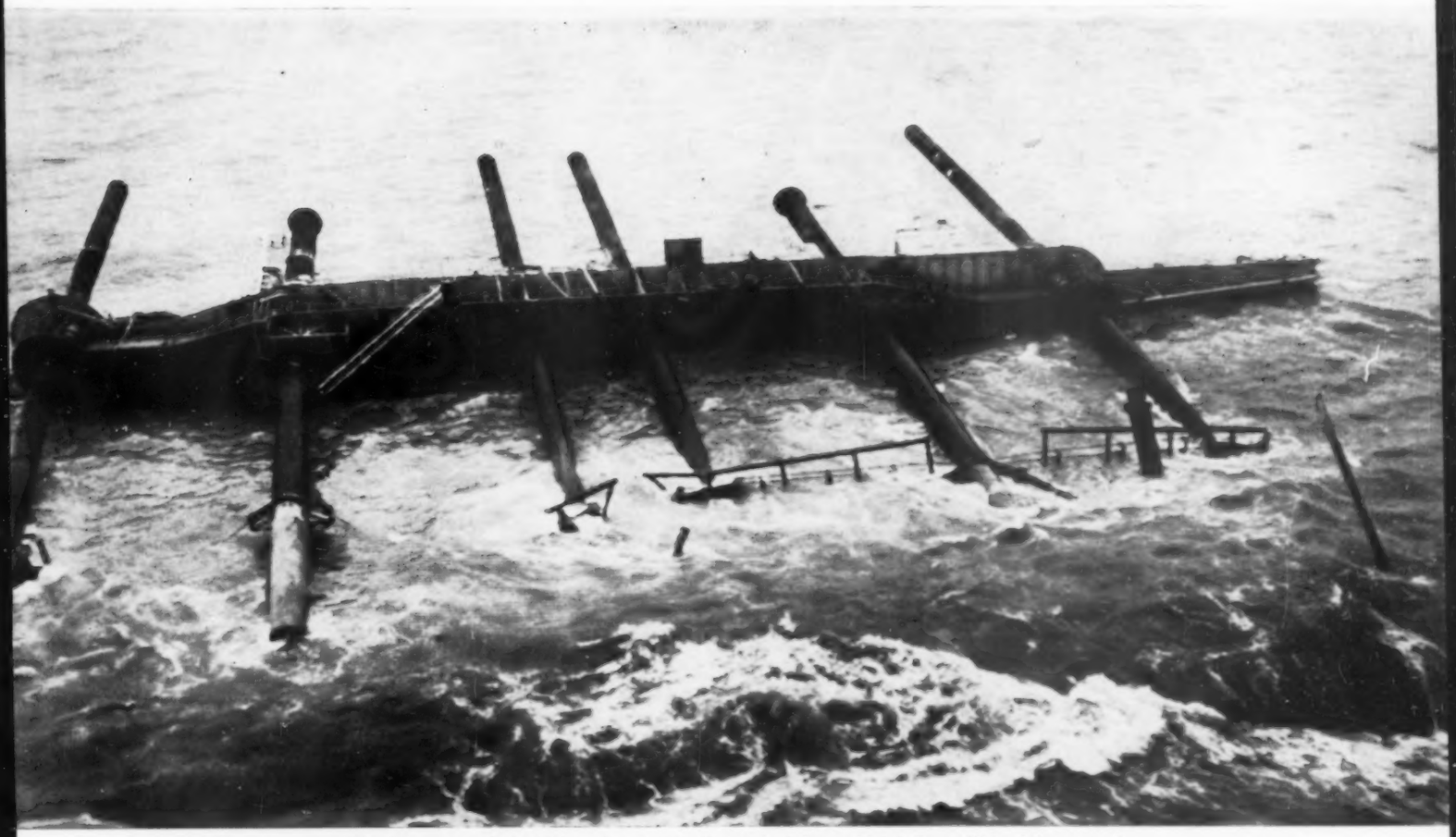
The development of the mobile drilling unit has been the natural outgrowth of a concentrated effort on the part of the offshore oil industry to reduce, in some measure, the enormous costs of drilling at sea. The first well to be drilled at sea, out of sight of land, was completed by Kerr-McGee Industries in 1947 from a permanent platform which, alone, cost more than $1,500,000 to build. Since that time operations in the Gulf of Mexico, off the coast of Texas and Louisiana, have expanded in a manner which, perhaps, has no parallel in industrial progress.

On May 1 of this year the US Coast Guard, which is responsible for navigational safety at sea, reported there were 531 offshore oil structures in the Gulf of Mexico, and 1,202 structures inshore but in navigational waters. This compared with 150 offshore and 908 inshore structures on the same date in 1954, or an increase of approximately 280% in three years.

Drilling a "wildcat" is risky enough at best; and, when that wildcat is drilled from a platform which has cost many thousands of dollars to build, the price becomes prohibitive for any but the major oil companies. Thus, when John Hayward devised a platform mounted on stilts on a barge, and figured out a method of submerging the barge to the bottom of the sea, he set a pattern which has been generally adopted by most offshore operators.

The mobile drilling rig has become the "wildcatter" of the submerged oil fields. If a dry hole is drilled from a permanent platform, the structure either must be dismantled, piece by piece, and thus removed as a navigational hazard; or, as is more often the case, it is abandoned but thereafter constantly lighted and maintained lest it becomes a menace to navigation.

When a mobile rig drills a "duster," the hole merely is abandoned and the rig moved



"Mr. Gus on its side in 35 feet of water 35 miles south of Corpus Christi, Texas. High winds prevented remedial work which might have saved the rig after it started to tilt.

to a new location; if it completes a well and proves an area, the rig is replaced by a production platform or a permanent structure from which production wells can be drilled.

Thus the mobile platform, or deep-water drilling barge, has become an important tool in the offshore oil fields, and is constantly increasing in stature. At the present time there are 32 of these units in operation, and Gulf Coast shipyards are working around the clock to fill back orders. It has been estimated that at least 150 such units will be required ultimately to satisfy the requirements of the industry—a significant increase over those now in operation.

In the evolution of the mobile drilling rig, three distinct types have been developed. Two of these types fall into the category of the drilling barge. Mr. Hayward's original design, on which he holds patents, was a barge with steel uprights on which was built a drilling platform. Many units of this basic design have been built and are in operation. These include the mobile units owned and operated by Kerr-McGee and by Ocean Drilling and Exploration Co., of New Orleans. Such was the design of American Tideland's rig "101," the first of the four mobile rigs to capsize.

This type of barge depends entirely upon the size of its bottom surface for stability. When lowered, one end of the barge is slowly submerged until it rests on the ocean floor, and then the other end is submerged. In raising the unit, one end is first floated, and then the other.

John LaBorde, president of ODECO and one of the pioneers in the offshore oil fields, believes that, if this type of rig is properly submerged or raised within the operating depth for which it was designed, it would be virtually impossible to capsize.

A second type of drilling barge, that used by The California Co. and other operators, gets its inherent stability by mechanical means. Outrigger pontoons, or footings, are first submerged and held firmly against the floor of the ocean by hydraulic rams, and then the main hull of the barge is flooded and lowered vertically.

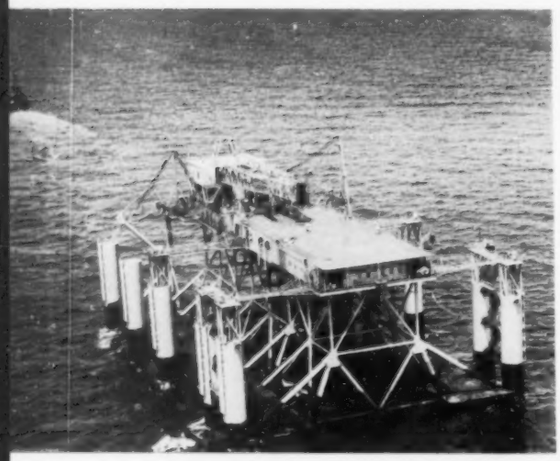
It was this type which capsized alongside its Mississippi River dock in the first fatal accident involving the giant mobile rigs.

The third type of unit generally in use is the platform which is towed to location as a barge and then, by mechanical means, drops its "legs" which are forced into the floor of the ocean as pilings. Once a solid footing has been reached, the barge is raised on the legs to drilling height and then becomes a fixed platform. Offshore Drilling and Exploration Co. was the first to utilize this principle in the use of the DeLong hydraulic jacks, which permitted the entire drilling platform to "shinny" up the steel piling like a small boy climbing a tree.

Glasscock-Tidelands utilized an adaptation of this principle in its "Mr. Gus," one of the largest offshore mobile rigs to be contructed. "Mr. Gus" was originally built in two pieces, with a bridge between. One leg was damaged on its first location and the two parts were permanently joined when the rig was towed back to the shipyard for repairs. In two years of operation "Mr. Gus" drilled a number of wells and successfully withstood many serious storms until it succumbed during a storm while undergoing repairs off the Texas coast on April 4.

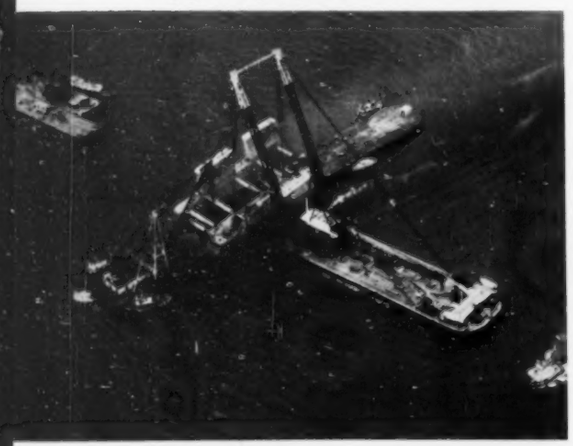
Another adaptation of the same design is found in the two mobile rigs built for Zapata Offshore Co. by R. G. LeTourneau

"Mister K," Golden Meadow Drilling Co.'s new rig No. 7, shown bottom up in the Gulf of Mexico a few hours after she had capsized on April 17.



Ocean Drilling & Exploration Co.'s drilling barge, "Margaret," being towed to location: Derrick is in the "down" position; drilling material has been securely lashed.

American Tidelands' rig No. 101, "Anastasia," first of the giant mobile drilling rigs to capsize. Photo shows J. Ray McDermott & Co.'s crane barge engaged in righting the structure.



Inc., the three-legged "Scorpion" and its new sister, "Vinegaroon."

The spud-type drilling platform must depend upon hard bottom conditions, since the spuds are subjected to terrific weight. These units cannot operate in many areas of the Gulf because of its soft bottom. The barge-type unit, on the other hand, can be used in practically all areas; the greatest danger is from scouring, or shifting of bottom sand as a result of water action.

All of the mobile units are entirely self-contained. They provide working areas for the drilling rig, quarters for the crew, all necessary machinery and warehouse facilities for pipe, mud, cement, drilling water, and other materials.

While the mobile drilling rig is primarily intended to be an island, from which drilling operations are conducted, every architect who designs such a structure is aware that it must be towed, as a vessel, from one location to another. As such, the unit is designed to float within a reasonable degree of safety. It is intended that this unit can be towed at sea under normal conditions, not in excessive winds or high seas, and only under proper towing conditions. The derrick should not be in the erected position, and the upper deck should not be overloaded with pipe and drilling supplies. If ballast is required, it should be there.

Under these conditions, the vessel is regarded as seaworthy and stable.

Most such rigs are designed to be safe with a list, or roll, of more than 25 deg.

By comparison, an ocean liner, designed to withstand all conditions of sea and weather, has a range of only 35 deg to 40 deg. By these standards, the average offshore mobile drilling rig more than meets reasonable safety requirements as a vessel. The mobile unit has one distinct advantage over the ocean liner: if caught in a storm, it has only to lower itself to the floor of the ocean. Hurricane "Flossy" ripped through the Gulf's submerged oil fields last fall—tearing floating tenders and barges loose from their moorings, but the mobile units weathered the worst of "Flossy" without damage.

Why, then, did the four rigs "flip," carrying 13 men to their death?

American Tidelands' rig 101, "Anastasia," was prepared to move off its first location for Humble Oil & Refining Co., 2½ miles off Grand Isle, on the morning of June 17, 1955. Forty three men were aboard. A diver was at work patching under-water leaks when the barge suddenly began to list.

"I came up just before the thing started going over," he later testified at a Coast Guard hearing. "It listed for a while before it went. I went over the side, down to where the lift rafts were. I'm not much of a churchman, but some of those guys ought to start going now, as scared as they were."

Another witness testified:

"I was asleep when the alarm came. I got up and dressed and got on topside. It was listing way over when I got up there. I don't know how far, but way over. Some of the boys got panicky. They started leaping overboard. Then I heard the drill pipe break loose and roll to the side. We had enough pipe to drill a 25,000-ft hole.

"By that time, most of the men were over the side. I rode a rope into the water. I guess 8 or 10 men stuck to the barge. They rode it right over. Probably we would all have been better off if we'd done that."

All survivors were picked up by crew boats and tugs.

The underwriters refused to pay the claim, and subsequently American Tidelands filed suit against Lloyds of London to recover $989,411.28 damages. The case is still pending. The rig was righted, towed to New Orleans and repaired, and has been working continuously since.

Southeastern Drilling Co.'s rig 22 was nearing completion in the Mississippi River, and on August 10, 1956 was being tested and loaded preparatory to leaving for a California Co. drilling location in Bay Marshand. Instructions had been issued to keep the draft of the floating section at a minimum, and not to exceed 6 ft 6 in. to assure proper stability and avoid any upsetting moments.

According to the US Coast Guard board of investigation, these instructions had been carried out prior to inclining and submerging tests on August 2. After these tests, during which the barge had been ballasted to a draft of 8 ft, the ballast was not pumped out and the vessel remained at that draft as work was continued.

On August 10 approximately 80 tons of drill pipe and casing were loaded onto the pipe rack, 40 tons on each side; the movable bow wedge was lowered in the down position to install additional brackets. In order to sink the bow wedge, approximately 100 tons of additional water ballast was required—placing the draft of the bow at about 9 ft 6 in. At this draft, with slack water in the ballast tanks, a progressive list began to develop to starboard.

While the workmen were in their quarters—changing clothing to leave work for the day—they felt a jar, and seconds later felt the barge begin to list. They rushed out of their quarters and attempted to get ashore, but the vessel quickly capsized before they could abandon ship, and the workmen were thrown into the water. Four were trapped inside the vessel and drowned.

Witnesses testified there was less than five minutes' warning from the time the barge began to list until it capsized. Rig 22, 156 ft long, 90 ft wide, and 11 ft deep, was designed to drill in 25 ft of water. Damage to the rig was estimated at $1,300,000—although it was subsequently salvaged, rebuilt, and is now in operation.

"Mr. Gus," the Glasscock-Tidelands mobile platform, was on location off the Texas coast early in April when one of her spuds apparently began to sink and the structure started to list. Further trouble developed when a barge broke loose in the high seas and crashed into the platform. Even at that, the structure might have been saved except for an incident which occurred on the highway near Orange, Texas. A truck

loaded with 40-ft piling being rushed to the scene was held up by highway patrolmen overnight because of a regulation restricting loads of that size on the highway after dark. Before the repair barge could get the necessary material aboard, the storm-swept Gulf had completed the task of destroying the huge drilling platform. The loss has been estimated at $2,500,000.

The fourth accident, which cost nine lives, involved the shallow-water drilling barge "Mister K," owned by Golden Meadow Drilling Co., of Houston, as she was being towed away from her location at the mouth of the Mississippi River's South Pass. The 140-ft derrick was in the upright position at the time, although the architect who had designed the vessel later testified that, in his opinion, the raised derrick was definitely not the cause of the tragedy. There was no stoppage of the forward motion to indicate that the vessel had struck a sand bar or other obstruction.

"Mister K" was a type known to the trade as a "swamp rig," and there are scores of them operating in the shallow bays and bayous which mark the Louisiana coast line. The barge was scheduled to drill on an inshore state lease for Humble Oil & Refining Co., but its shell bed had eroded and the vessel was being towed away so the bed could be repaired. At the time, it was in deep water, about one mile south of South Pass. Fifteen men were on board. The tool pusher was in charge.

He later testified at a Coast Guard hearing that the barge had been moved from East Bay to South Pass three times, each time passing the South Pass to the Mississippi River, and that the derrick had been kept in place each time she was moved. He said the derrick had not been lowered since the barge was first put on its first location.

Loaded aboard the vessel at the time she capsized were some 40,000 lb of various drilling-fluid additives in preparation for drilling the hole.

The witness further testified, under questioning by Coast Guard officers, that he had not conducted emergency drills on the barge, and was not aware that any drills had ever been conducted. He said there was no emergency alarm bell.

Under the Outer Continental Shelf Lands Act of 1952, governmental jurisdiction over offshore drilling operations is divided among several agencies. Duties of the US Army Corps of Engineers and the Department of Interior were extended to include offshore rigs, and the US Coast Guard was charged with the responsibility for safety of life. It is required to inspect these vessels for such safety devices as adequate railings, proper fire-fighting equipment, life rafts, life jackets, and other safeguards of life.

While the Coast Guard has jurisdiction over mobile drilling units as "artificial islands," it has no control over the movement of these units from one location to another. Investigation of the "Mister K" disaster is still in progress, and Coast Guard officers are waiting until the vessel has been salvaged to inspect under-water safety devices in an attempt to determine why the big 250-ft x 175-ft barge turned over in relatively calm seas.

Five Mobile Rig Disasters

June 17, 1955—American Tidelands mobile rig "101" capsized 2½ miles off Grand Isle in the Gulf of Mexico while being raised to move to a new location. Forty-three men aboard—non lost. Damage: $989,411.28.

August 10, 1956—Southeastern Drilling Corp.'s new mobile rig capsized at dock of Avondale Marine Ways Inc., New Orleans, while being readied for sea. Forty-two men aboard—four lives lost, five injured. Damage: $1,300,000.

December 27, 1956—Shell Exploration Co. mobile rig, under tow to a new location, was partially wrecked 50 miles off Qatar in the Persian Gulf when a sudden change in wind kicked up heavy seas which broke loose two 2,000-ton pontoons and damaged platform legs and other equipment, much of which fell into the Gulf. Rig cost $1,400,000. Several lives were lost.

April 4, 1957—Glasscock-Tideland's mobile drilling platform "Mr. Gus" capsized in storm off Padre Island, Texas, 32 miles south of Port Aransas, while being repaired. No casualties. Damage: approximately $2,500,000.

April 17, 1957—Golden Meadow Drilling Co.'s inshore mobile rig "Mister K" capsized off South Pass of Mississippi River, in Gulf of Mexico, while being towed from marsh location. Fifteen men aboard; nine lives lost. Damage $1,250,000.

The Coast Guard Marine Board investigating the capsizing of Southeastern Drilling Co. rig 22 recommended that regulations be amended to require Coast Guard approval of plans and inspection during construction of all mobile platforms. Recommendation was approved by the commandant, and has been referred to the Merchant Marine Council for further consideration.

If written into law, this will mean that the US Coast Guard will henceforth require approval of plans for all mobile drilling units in the same manner it must now approve plans for construction of all other seagoing vessels.

Most operators contend they maintain far greater safety standards than those required by governmental supervision. For example, Ocean Drilling and Exploration Co. has a firm policy in which the width of the rig, related to the depth of the water, provides a maximum angle transversely of 15 deg, and longitudinally of 10 deg. Hence, in a maximum of 65 ft of water, the unit must be 200 ft wide and 300 ft long to maintain this standard of safe operation. Obviously, the working surface of the hull will not require this dimension, so the company has added "dumbells," or outrigger tanks, to the hull of the vessel to provide the required width and length to achieve this basic design.

It is another ODECO policy that only four men in the organization shall supervise the raising and lowering of any of the company's four units. One is LaBorde, a graduate of the US Naval Academy and formerly marine superintendent for Kerr-McGee Industries. The other three are all qualified engineers with seagoing background. These are standing company orders, to be violated only in the event of emergency.

This company, as all others consulted, moves its rigs only during favorable weather conditions. If seas are 5 ft or more in height, the rig will wait for calmer sea conditions.

These rigs have a specific stowage plan which is put in operation while rigs are being raised or lowered, or moved to another location. The derrick is laid down, all pipe and drilling supplies are securely lashed, and the vessel is in a state equivalent to the US Navy's "general quarters"—with all hands assigned to specific posts and duties. This is not so much for personal safety as it is functional; there are enough duties during the time a rig is being moved that all hands are needed.

All offshore units and platforms, whether mobile or stationary, are required to post "watch, quarter, and station" bills assigning personnel to specific posts in the event of certain emergencies; there must be life preservers and rafts or boats for all persons aboard; and it is a requirement that monthly emergency drills be held.

With all the safeguards against accident, and the improvements being designed and built into offshore drilling units, the seagoing oil man still has a precarious trade—and no group is more aware of this than the underwriters.

Most of the mobile units not company-insured are protected by the London insurance market. Insurance rates on mobile drilling units vary as much as 1½% to 4%. The underwriters, accepting fixed premium rates, say they are finding the risk is out of proportion to the return. A drilling barge is subject to 100% loss. Fifteen minutes of a blowout might completely destroy a seagoing unit. Added to the normal oil-field risks—fire, blowout, and cratering—are the marine perils. A firm of underwriters has recently employed a naval architect to serve as an advisor in matters pertaining to offshore oil operations; and one insurance man said it is reasonable to assume that insurance companies ultimately may require oil operators to employ independent marine surveyors and engineers to perform the function of raising, lowering, and moving mobile drilling rigs.

The history of insurance has had only one parallel to the problem of underwriting the offshore drilling operations; that was in the early days of oil refining when installations, improperly engineered by present standards, represented high risk at uncertain fixed rates.

At a time when it appeared that insurors might eliminate oil refining from the category of insurable industries, the Oil Insurance Assn. and the John G. Simmons Pool were created to solve the problem.

While boasting that the underwriting market has never let industry down, insurance men predict that, in the case of the mobile drilling rigs, the underwriters may boost and equalize their rates while enforcing sterner rules—like requiring oil companies to hire seamen to do the seagoing chores. END

oil in the

SAHARA

by Maurice Moyal

The outstanding recent oil discovery in the world is the Sahara area, where French companies have made a series of recent strikes. It is not likely these strikes will prove to be disappointing, in view of the wide distribution of proved sediments, and they are particularly important to France and Western Europe due to their strategic location.

For a long time geologists have said that great oil wealth may lie beneath Algeria's 900,000 square miles, most of it uninhabited Saharan desert country. As early as 1890, exploratory drilling uncovered a few shallow deposits at Tiliaounet, near Algiers.

It was not until 1946, however, that a methodical mapping of the country got underway. The French government and the general government of Algeria set up jointly the Société Nationale de Réchèrches et d'Exploitation des Pétroles, known as the SN Repal.

Prospective Oil-Bearing Territory: Surface and subsurface surveys carried out by SN Repal show that the following regions in north Algeria may be regarded as prospective producing territory: 1, the Eocene basin of the Hodna, in the immediate vicinity of the Mediterranean seaboard (proved oil-bearing by Oued Gueterini); 2, the northern edges of the high plateaus; and, 3, the region east of Constantine.

Air surveys, gravimetric and magnetometer work, to a lesser extent geological and geophysical studies, plus exploratory drilling carried out by SN Repal and three other companies, have established, from north to south, three encouraging areas: 1, the "Oasis Sahariènnes" region, around Ghardaia (proved oil-bearing by Hassi R'Mel and Talemzane); 2, the Oued-Mya region, some 400 miles south of the Mediterranean seaboard (proved oil-bearing by Hassi-Massouad); and, 3, the Zarzaitine area, in eastern Sahara, along the Libyan border (proved oil-bearing by Edjele-Tinguentourine).

In addition, the crystalline Hoggar range in deep Saharan south, near the border of French West Africa, is favorably regarded for its big natural-gas prospects, as evidenced by Djebel Bergha and other methane finds in the Ahnet basin.

The Oued Gueterini Field: The one commercially productive area in northern Algeria is the Oued Gueterini field, in the Hodna basin, roughly halfway between Algiers and Constantine. The discovery in 1949 proved productive from the Miocene structure at a shallow depth.

More than 70 wells have been drilled to establish the boundaries of the production area—most of it hidden under discordant masses. In 1956 I LK, spudded 10 miles S-W of the pool, quashed prospects of development in that direction; while I NZ, drilled 30 miles to its west, proved a dry hole.

From a peak of 1,720 b/d in 1953, production fell to 700 b/d in 1956. The local crude is high-grade and light. It has a specific gravity of 0.830 and a negligible amount of sulfur, that bane of Middle Eastern crude. By weight, it yields 34% automotive gasoline, 32% fuel oil, 24% gas oil, 8% lube oil, and only 1% paraffin.

Six wells were productive in 1956, against 13 in 1955. Extensive faulting and invasion of salt water account for this decline. The partially depleted pool may be abandoned altogether in the near future. Total withdrawals up to 1956 added up to 2,687,959 bbl.

In the Chelif basin, SN Repal drilled a number of exploratory holes to determine whether the crude already known to exist in the Upper Miocene of the Tliaounet structure is there in commercial volume. Two tests logged oil shows in the Lower Miocene and Oligocene horizons.

In the Lower Miocene east of Constantine,

Promising oil shows on its Oued Rharbi concession have encouraged SN Repal to explore the area methodically.

and some 100 miles from the western Mediterranean, an exploratory hole on the Djebel Foua, near the Tunisian border, uncovered at about 3,070 ft a prolific condensate-bearing gas deposit in the Lower Senonian. The well was potentialled for about 53 million cubic feet per day from the Vraconian, but the bottom-hole pressure was only 426.7 psi. The wildcat was stopped at 13,000 ft in the Hauterivian without encountering oil.

Four Major Companies Active in Sahara: Both in northern Algeria and in the Sahara, SN Repal has secured 11 prospecting licenses, covering nearly 100,000 square miles. In addition, it operates another seven concessions covering 50,000 square miles for the French government's Compagnie Française des Pétroles Algérie, known as CFPA. Their joint block of permits takes in the whole width of the Sahara, from Colomb-Bechar on the Moroccan border to Tebessa on the Tunisian border; and from Biskra to well south of El-Golea. Theirs is the most favorable area—both from the geographical and geological viewpoints—where the most prolific strikes to date have been uncovered in North Africa.

To the south of their concessions, the Compagnie des Pétroles d'Algérie, known as CPA, is a joint enterprise of the French government and of Shell, which owns a 65% controlling interest. It holds a compact block of seven leases covering 70,000 square miles, and comprises all the country between the Great Western Erg and the Great Eastern Erg.

Still to the south of the CPA permit area, the Compagnie de Réchèrches et d'Exploitation des Pétroles au Sahara, known as CREPS, is a similar enterprise, where Shell owns a 35% minority interest. It has secured seven licenses, aggregating 60,000 square miles from the Adrar range to the border of Libya. Its geographical location is the remotest in relation to the consuming centers, but it has an advantage over the three other companies' areas, which partly makes up for this handicap. It contains a Primary-age series with surface expression. Thus likely drilling locations can be pinpointed here far more quickly and at less expenses.

Technical and climatic difficulties are tremendous in these most forbidding stretches of wind-blown sands, strewn with residual gravel, which lie on calcareous sandstone of Eocene and Cretaceous ages, with a pre-Cambrian substratum. Extremes in temperature may range all the way between 41 F and 95 F within 24 hours. No detailed maps of this area had ever been drawn before. The total absence of local resources made it imperative to plan not only for oil development, but also for every requirement of modern life.

One of the major problems in drilling operations was to obtain a satisfactory supply of water to drill in that seemingly parched country. An average hole required 13,200 gal of water a day, to be purchased at the equivalent of $2,000 from haulers. However, it subsequently turned out that plentiful water supplies are obtainable almost everywhere from water wells which encounter aquifers from 3,000 ft in the Albian. (*Note:* Where feasible, McLaughlin proposes the use of compressed air to eliminate this problem of water shortage.)

One geophysical, 10 gravimetric, and 14 seismic crews have been put in the field for gathering every sort of surface and subsurface data to define the general structural

trends. As structures have generally no surface expression, the usual geophysical methods are of not much avail over widespread areas. As likely as not, costly and inconclusive seismic refraction has to be relied upon.

Although it had no commercial value, I BE proved the key hole on the edges of the Great Western Erg. SN Repal started spudding this wildcat on its Berriane concession, roughly midway between Laghouat and Ghardaia, in November 1954. It penetrated the Jurassic, uncovered a small wet-gas deposit, and logged oil shows from the salt-bearing Trias, went through a residual series of unidentified age, to reach 9,148 ft in the preCambrian substratum. It was the very first time positive proof of the existence of oil was discovered in these vast stretches, establishing that the Trias was the likeliest potential pay here.

I El Golea uncovered the lack of continuity of the Trias to the south of I BE; while further drillings to its east uncovered only salt water, but in such volume and pressure as to amplify the previous seismic reconnaissance at Tilrhempt. The upshot was the discovery of two pools, apparently capable of commercial exploitation, on the edges of the Great Western Erg.

CFPA Discovers Two Pools: At Hassi R'Mel, in the immediate vicinity of the old fort at Tilrhempt, 65 miles south of Laghouat and 30 miles east of Berriane, I HR unblocked out a considerable gas deposit. It tested many thousands of cubic feet per hour of condensate-bearing wet gas, apparently capable of being profitably piped to Algiers and Oran. After traversing the crest of that broad gas cap, the test penetrated a prolific oil-bearing Trias reservoir. At this writing, SN Repal's Ideco 750 rig is coring below 7,325 ft, and the thickness of the impregnated section is at least 130 ft. II HR is already spudding for a west offset, and a location is graded for an east offset. Although the operator has not released information on those tests, beyond the mere statement that gas exists here in apparently commercial volume, field reports credit the discovery with containing some 750 million barrels of better-grade crude.

At Talemzane, on its Laghouat concession, CFPA has uncovered another find, a mile or two north of Hassi R'Mel and 75 miles S-E of Laghouat. On drill-stem tests, run between 8,000 ft to 8,250 ft, I LI flowed thousands of barrels of light crude from a porous reservoir. The impregnated Trias section consists of 517 ft of limestones, with scattered marly streaks in between. CFPA's heavy-duty Emsco J 1400 rig has started drilling II LI for a west offset. The crew is making preparations to put it on choke when traversing the pay section revealed by I LI. They are grading a location for an east offset.

Most Prolific Strike in the Sahara: The Hassi-Messouad structure, located on seismic refraction at 50 miles S-E of Laghouat, and a mile or two south of Hassi R'Mel, has yielded the most prolific strike to date in North Africa. Started on SN Repal's Oued-Mya permit, I MD was about to be given up as a dry hole. Before moving the heavy-duty Emsco rig to a new location, the crew decided to try out one last section of drill pipe—to encounter a first porous limestone layer at 7,100 ft.

Taken down to 9,987 ft, the test uncovered, June 14, 1956, a thickly impregnated quartzite series of the Trias. Put on ¼-in. choke, the discovery flowed an initial 388,-410,000 cu ft under a bottom-hole pressure of 1,280 psi. Although production is currently curtailed, pending the construction of a tankfarm, I MD is flowing 5,298 cu ft per day, while II MD produces 10,596 cu ft per day of a better-grade crude, with a specific gravity of 0.827, containing a negligible amount of sulfur. It yields at least 45% automotive gasoline. After mere filtering, it is used to power the local drilling engines.

For the 517-ft thickness of its gross pay and the fact that the Hassi-Messouad anticline stretches along over 40 miles, the find has touched off an oil fever in France. On the theoretical basis that the bulk volume of the reservoir may run to about 24 million barrels per square foot, it has been rashly ventured that three score billion barrels exist here. Thus the find would outrank some of the most fabulous oil strikes the world over.

Granted the areal extent of the anticline and the thickness of the gross pay can bear favorable comparison to the best in the Middle East and Venezuela, still the reservoir may not run the whole area of the anticline, and gross pay is not quite the same thing as net pay. Even if the structure as a whole is one reservoir, extensive faulting may have greatly affected it. As already determined from two completions, only 50% of the local crude might be recovered, as against 73% in Kuwait. From analyzes made on core, it was determined that the reservoir media have a weighted porosity of 7% to 20% of the bulk volume, and the weighted average residual-water saturation is 50% of the pore volume.

But still greater structural variations may exist in the intervals between the two initial wells, and seismic interpretation is not conclusive at depths of 10,000 ft and over. According to the operator's conservative estimates, the new field would contain 750 million barrels of reserves, while field reports put them at 2,255 million barrels. Already west offset II MD is drilling below 5,000 ft. The operator will soon have six more rigs in the field, and they should help tell the story. Still, it will take two years to evaluate the real caliber of the find and assess the best exploitation methods. Currently, 1,500 b/d is trucked 112 miles to the nearest railway terminal at Touggourt, to speed up shipment by railway and tankers to oil-starved France. The crude is refined at the Shell-owned refineries on the shores of the sea-linked Lake of Berre, in the Greater Marseilles area. Deliveries are to be boosted to 9,000 b/d by the end of this year, when trucks will have been replaced with a temporary 6-in. pipeline from Hassi-Messouad to Touggourt.

From all Saharan sources, France expects to get 3,700,000 bbl in 1958, to be gradually boosted to 74 million barrels, or about 35% of her domestic oil consumption, by 1960. A government project contemplates the construction of a 405-mile 30-in. pipeline from Hassi Messouad to the western Mediterranean, across the rugged Kabylie mountains, along the valley of the Souman, via El Oued, Negrine, the Djebel Honk, Tebessa, and on to Philippeville, recently chosen as the port. A 40,000 b/d refinery will be provided at the chosen terminal, and only the surplus will be then shipped to the Shell refineries.

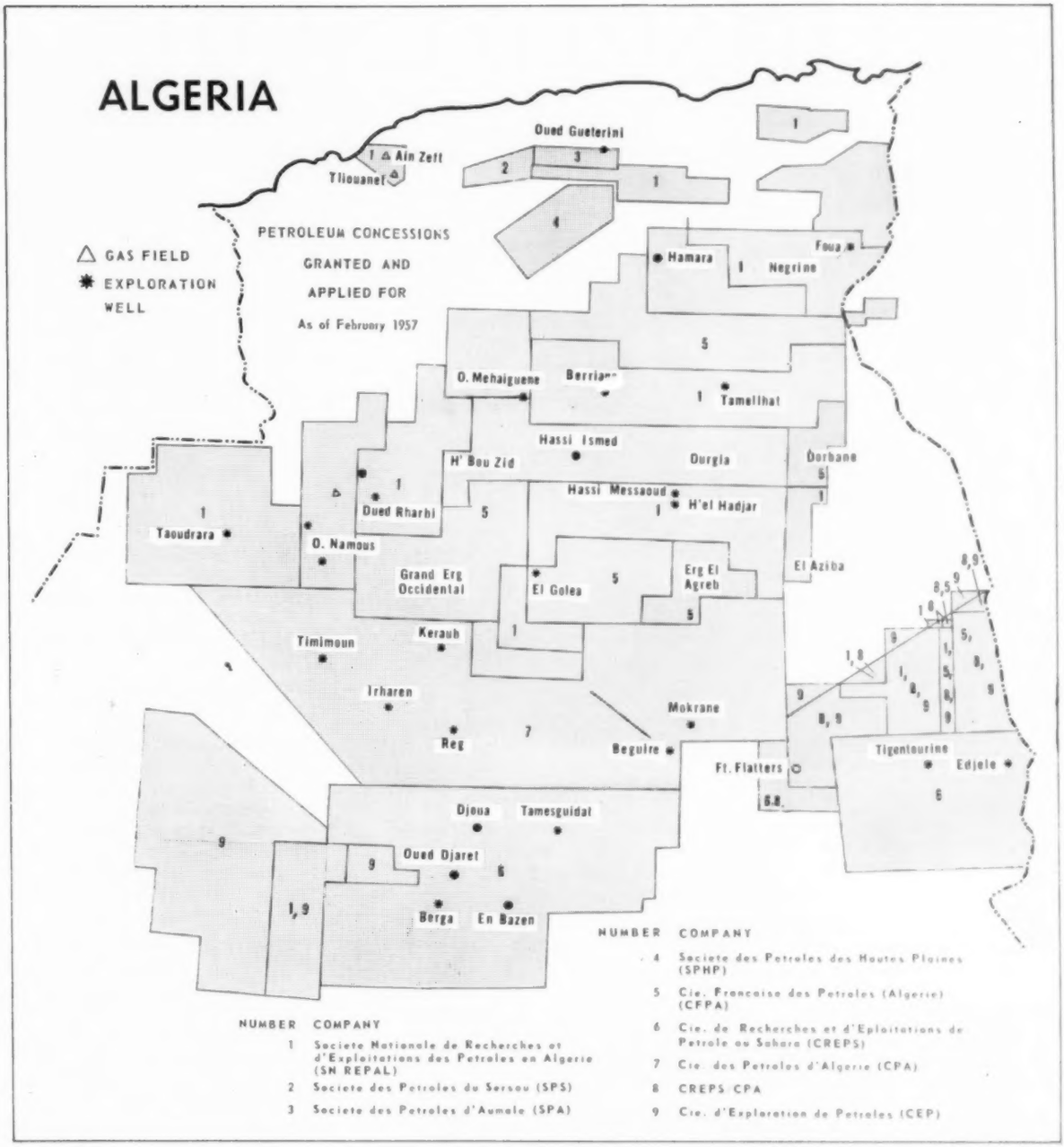
This ambitious program is to cost a total of $750 million, to be spread over three years; $20 million will be devoted to exploration; $75 million to the construction of roads and 'dromes; while $135 million will go to the construction of a refinery, petrochemical plants, and steel works. The methodical development of both the Hassi-Messouad and Edjele-Tinguentourine twin fields will claim $120 million, and a further $160 million is to be allocated for the construction of outlets to the western Mediterranean.

The provisions of the third five-year plan established at the end of 1956 appear already to have been exceeded. This plan provided for the period 1956-69 about $700 million to discover 700 million barrels of reserves, but known reserves now exceed 1.4 billion barrels.

On the CREPS east Saharan Zarzaitine concession, lying some 100 miles S-E of Libya's Ghadames, where the frontiers of Algeria, Libya, and Tunisia converge, bore holes drilled for geological information at Edjele, 250 miles due west of Fort Flatters, struck in November 1955 an oil-bearing layer at about 250 ft—too shallow to pay. IOI DL, spudded by a heavier rig, traversed three oil-bearing limestone layers, separated from one another by marly intervals, and uncovered a gas find. Put on ¼-in. choke, the discovery flowed, in January 1956, 105.6 cu ft per day of a light crude for two days. It was the first time oil in apparently commercial volume was struck in the Sahara.

Six months later, pay dirt was hit again at Tinguentourine, 60 miles west of Edjele, from a porous limestone reservoir at about 1,700 ft. Put on a ¼-in. choke, the discovery tested about 141 cu ft per day. Here again, the better-grade crude is light and has no sulfur to speak of. Rich in automotive gasoline and gas oil, it is used after mere filtering for fuel for the local rigs.

Currently, Tinguentourine has two productive wells, and Edjele four, potentialled each for 2,640 to 2,816 cu ft per day. On the basis that all four wells at Edjele tested oil from about 1,450 ft—making, possibly, the structure as a whole one reservoir—certain circles close to the French government ventured that 30 million barrels would be



shipped from both pools to France by 1959. This prediction might prove rash, the more so since the Edjele and Tinguentourine anticlines have not yet been completely defined. To fulfil the quota (granted the crude is there at all in such volumes) it would take 300 development and extension wells. Where are the rigs supposed to come from—currently a precious commodity on the USA market? France turns out only spares and auxiliary equipment.

Under present circumstances, field reports credit the two pools with commercial possibilities only if further fields were uncovered in east Sahara. This comes within the realm of possibilities. Esso Standard is busy on its In-Azaua concession on the other side of the Libyan border from Edjele; while Libyan-American, a Gulf subsidiary, holds prospecting licenses to its south. To the north, Amerada has secured the Gaadames lease, and has a next-door French neighbor. The French-controlled Société des Réchèrches et d'Exploitation des Pétroles en Tunisie, known as SEREPT, keeps doggedly exploring southern Tunisia. If these neighbors struck it rich, they would be eager to share in the heavy outlays involved in the construction of a 500-mile 12-in. or 16-in. pipeline to move the oil.

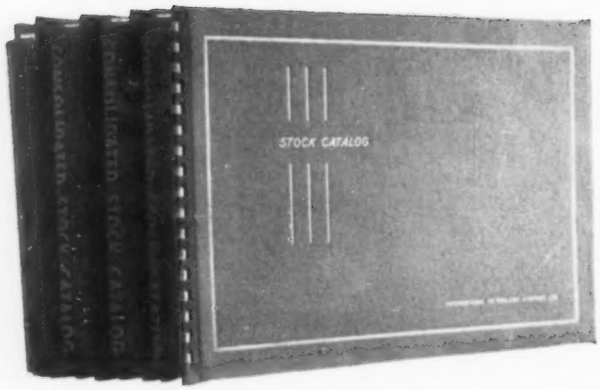
The French government first envisaged to link Edjele to Hassi-Messouad, so as to cut across French-controlled territory all the way, and provide one series of pumping stations along the home stretch. But it seems that the twice-as-long uphill Algerian route would not be entertained. Edjele sits on a plateau about 1,000 ft above sea level, thus enabling the crude to flow by gravity to western Mediterranean terminals. Most probably, the trunk line will skirt the Algero-Libyan border up to Ghadames, where it will branch to Tunisia's Zarzis, on the Gabes Gulf, and to Libya's Zoara, on the Tripoli Gulf. Offsetting the advantages of this shorter route are the handicaps imposed by the lack of port facilities at both terminals. But protected "shallows" at both places will permit moving the crude along sea-loading lines onto tankers,

(*Continued on page 72*)

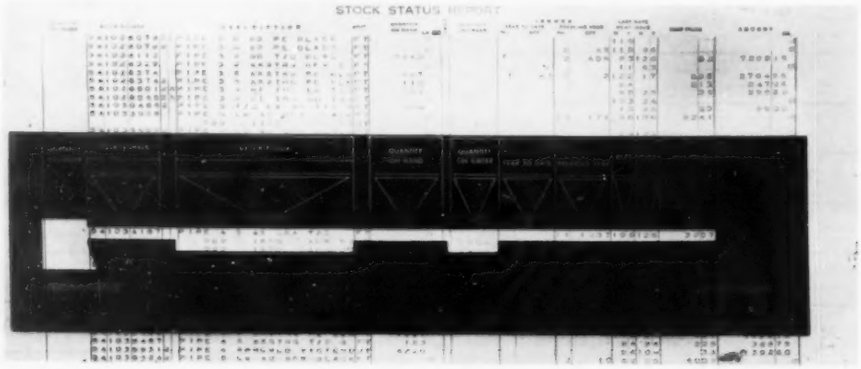
MECHANIZED CATALOG

features materials accounting system

By John D. Hall*

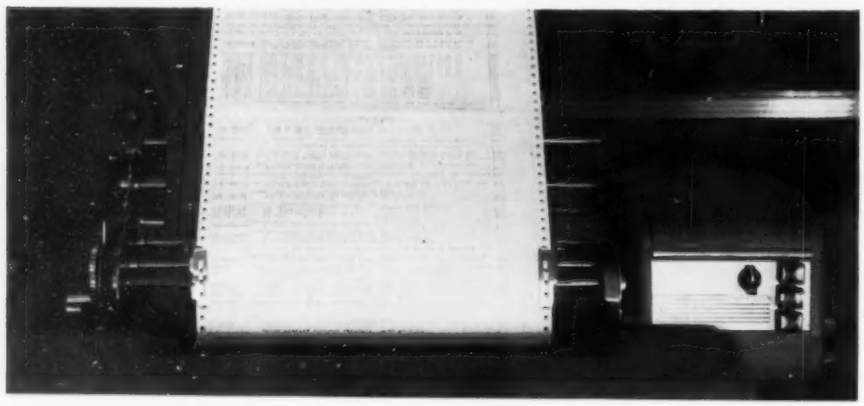


International's master stock catalog consists of only four volumes, each about 1¼-in. thick, containing 100,000 number symbols and article descriptions. The binding is an attractive red imprinted with gold lines and lettering. Green-tinted paper is used for the master catalog and operators' catalogs as well.



As an aid to the constant users of the stock status report, a plastic guide was developed. It is shown here in place over a page of the stock status report. It reduces eye strain, and aids concentration by blocking out all but the item being reviewed.

A punched-card machine in the process of printing the catalog on duplimat forms from which the required number of copies is made.



Substantial equipment inventory reduction follows development of simplified, four-volume catalog of 100,000 stock items.

IN 1953 International Petroleum Co. Ltd., an affiliate of Standard Oil Co. (N. J.), decided to install a mechanized materials catalog and symbols control system for its extensive materials operations in South America. This decision was reached after a survey which included visits to major oil companies, in Venezuela; Lago Oil & Refining Co., in Aruba; and manufacturers of business machines in the United States. Discussions with materials and accounting personnel and machine experts at the various points visited led to the following broad conclusions:

A sound cataloging system is highly essential to proper administration of materials planning.

Mechanization provides the most satisfactory means of materials accounting and inventory control when volume and related factors warrant it.

Statistical data, much of which cannot opportunely or economically be provided manually, are readily available under a mechanized system.

Beyond these basic concepts, an evaluation of past methods of cataloging indicated

* International Petroleum Co. Ltd., Coral Gables, Fla.

John D. Hall started in the oil business first as a roustabout and later as a farm boss for the Hope Natural Gas Co., in West Virginia. He joined the staff of International Petroleum Co. Ltd., in 1929. After a period as materials department superintendent at Talara and manager of the materials department in Lima, he was transferred in 1948 to Toronto, as assistant materials coordinator. Mr. Hall is now stationed in the company's executive office in Coral Gables, Fla. As materials coordinator for International and affiliated companies, he furnished overall guidance for the cataloging program which this article describes.

the need for a more compact catalog which could be printed and maintained with greater facility and at less cost than under usual procedures. Also, International's widely spread activities in Colombia and Peru in marketing, refining, exploration, producing, and pipeline operations demanded a catalog of maximum flexibility. After 30 months of intensive effort, the new materials system was completed and installed. It not only provides mechanization as practiced today by large oil companies in materials accounting, but furnishes a completely mechanized catalog which fully meets the further objectives of compactness, low-cost maintenance, rapid duplication, and the selective catalog requirements of operators.

In order to build a materials catalog to meet these major objectives, a materials catalog project was organized under the auspices of the company's materials coordinator. The project manager, together with a task force of cataloging personnel, was located at Talara, Peru, where punched-card machines were already in use for payroll purposes and the most extensive warehouse operation of the company functions. Several months were spent in the planning stages of the project, which is considered one of the keys to the success of the entire cataloging program. To meet the overall requirements of operations in both Colombia and Peru, a companywide consolidated stock catalog, listing all articles stocked, was deemed a primary requisite. This catalog serves three main purposes:

1. As a central catalog office master control for the addition and deletion of stock articles.

2. As a reference for ascertaining whether or not a new article required at any requisitioning point is already in the overall catalog system.

3. As a guide in emergencies to determine whether a particular article is in stock at a neighboring location.

All the cataloged articles were arranged logically according to a classification which best met the needs of the company as a whole (see Materials Classification Chart herein). There are nearly 100 separate stock classes which can be divided into four major categories:

1. *Common-Use Classes:* Articles classified according to like characteristics and which are used by several or many departments, such as nuts, bolts, common hardware, and pipe fittings.

2. *End-Use Classes:* Articles classified according to end use, stocked solely or primarily for a single department; for example, hospital supplies, drilling tools, marine articles, and welding equipment and supplies.

3. *Spare-Parts Classes:* Spare parts for particular kinds of parent equipment, such as gasoline engine parts, centrifugal pump parts, or parts of a given manufacturer such as Caterpillar.

4. *Temporary Classes:* Articles which for various reasons are not be be regularly stocked or cataloged but are assigned temporary stock numbers for clerical and physical control purposes.

Those familiar with industrial materials catalogs are aware of the usual black binding and the voluminous nature of such catalog. Up to 25 thick volumes are necessary to provide for as many as 100,000 stock items under old catalog procedures. International's new catalog consists of only four loose-leaf volumes embracing 100,000 separate symbols and article descriptions. An innovation in cataloging is the color scheme of the binders. An attractive red imprinted with gold lines and lettering gives the catalog a bright appearance and an appeal to catalog users.

One of the outstanding features of International materials catalog is "built-in" interchangeability of spare parts for parent equipment. The integration of interchangeability with other functions of the catalog is a practicable step only when mechanization is applied to the catalog itself.

The heart of International's new materials system is the electrically-activated punched-card tabulating equipment which has become available to industry in recent years. Such automatic equipment is utilized for printing International's consolidated stock catalog, keeping it up to date and providing operators and warehouse locations with their individual catalog needs. The required number of catalogs is obtained from the punched-card machines by printing directly on duplimat forms from which any number of copies can be duplicated. A single class of materials, or combinations of classes, and groups of cataloged items by locations can be obtained by machine-sorting of the punched cards according to predetermined codes to fit these and other requirements Thus, any warehouse location can have as many catalogs as necessary, listing only those items with which it is concerned. Likewise, an operator can be furnished with catalogs for his use for only those items in which he is normally interested.

The system eliminates the laborious and expensive maintenance problem of past methods which necessitates the typewritten preparation of change sheets, the perpetual tearing apart of issued catalogs for the inclusion of revised pages and rewritten classes, the insertion and deletion of individual items where complete pages or classes are not rewritten, and the proofreading of all such changes.

Basically, International's catalog maintenance consists of periodically issuing machine-printed supplements to the consolidated catalog for a period of six months or up to a year—depending on activity—and the periodic reprinting of updated catalogs from a set of master cards from which dead items have been deleted and to which new items have been added. Revised article descriptions are handled in the same manner.

That this method of printing and maintaining a materials catalog results in lower costs is borne out by the fact that International is currently providing overall catalog maintenance for its extensive materials operations in two countries with three employees—a cataloging coordinator, an office assistant, and one combination typist-keypunch operator. It is estimated that International's catalog maintenance costs are at least 50% less than such costs under non-mechanized maintenance methods in materials operations of similar magnitude. The fact that the cost of producing the first 25 copies of the consolidated stock catalog, consisting of 100,000 items, was only $28.02 per catalog also points up the advantages of materials catalog mechanization.

An effective adjunct of International's new materials catalog and symbols control system is the stock status report. It furnishes, in addition to the usual data appearing in such reports, on-order references which appear immediately below each item in the "description" column. Also, cumulative issues for the current year and total consumption figures for the previous year are included for each item. Thus, no less than a 13-month history of consumption, and up to 24 months, is provided as the year progresses. The stock status report, normally issued once a month, is so designed that it replaces unwieldy card records which require extensive housing space and expensive manual posting. When deemed necessary for certain classes of fast-moving material, supplementary weekly stock status reports are issued. By means of a decimal control of minimum stock balances, items requiring attention by ordering clerks are automatically asterisked by the tabulating machine on which the stock status report is printed. This enables ordering clerks to give special attention to those stocks requiring action while ignoring those items

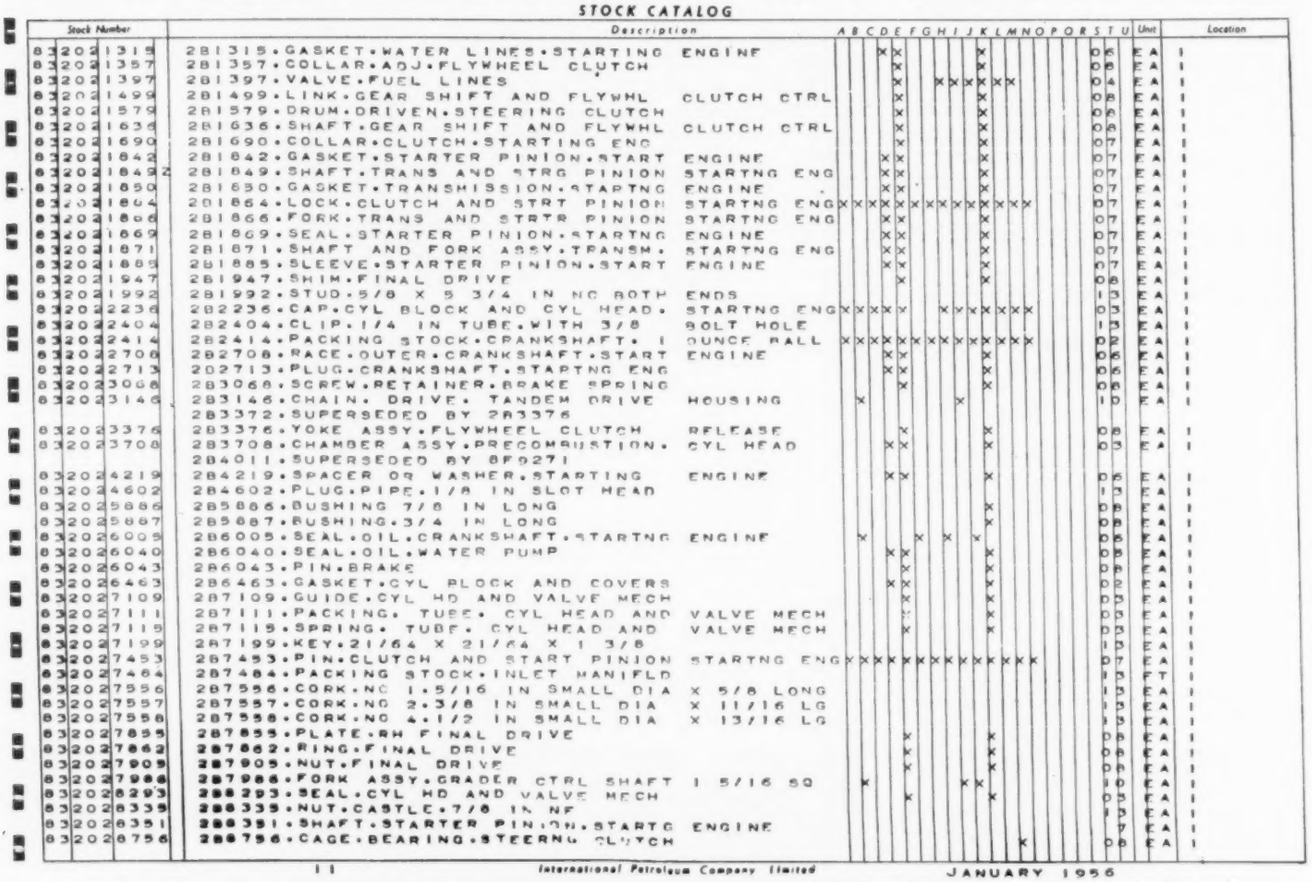
which are still in ample stock position for current consumption requirements.

An important contributing factor in the successful termination of International's cataloging project was the hiring of cataloging personnel of wide experience and adequately recompensing them for their services. That this policy paid off is attested to by the fact that no personnel turnover problems were encountered for the duration of the project, and that the budgeted estimate of the cost of building the catalog and installing the system was not overrun. Every employee who started work on the project continued on the job to its completion.

Another factor which played a very important part in the overall success of the program was the cooperative assistance furnished by the materials groups in both countries—at Talara, Lima, and Callao in Peru; and at Bogota, La Dorado, Barranquilla, Barranca, Cartagena, Agua Chica, and Calamar in Colombia. The new mechanized system benefits all these materials organizations in the procurement, receipt, warehousing, and issuing of materials. It further assists them by providing an effective means of inventory control in all its phases.

To insure the continued and efficient operation of the new system in isolated and widely separated locations, a new position designated as "materials cataloging coordinator" was created. Among other things, it will be the responsibility of the coordinator to follow up on all phases of the mechanized materials system, to institute studies in standardization, and to extend the application of the system to new locations as demanded by future expansion of the company's operations.

Well in advance of the completion of the cataloging program, a manual was drawn up detailing the advantages of the new system, outlining its salient features, and clarifying the objectives it encompassed. Moreover, long before any attempt was made to utilize the new catalog and install



STOCK CATALOG

Stock Number	Description	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	Unit	Location
8320211315	281315 GASKET WATER LINES STARTING ENGINE					X	X					X									D6		EA	1
8320211357	281357 COLLAR ADJ FLYWHEEL CLUTCH						X					X									D8		EA	1
8320211397	281397 VALVE FUEL LINES						X		X	X	X	X	X	X							D4		EA	1
8320211499	281499 LINK GEAR SHIFT AND FLYWHL CLUTCH CTRL						X					X									D8		EA	1
8320211579	281579 DRUM DRIVEN STEERING CLUTCH						X					X									D8		EA	1
8320211636	281636 SHAFT GEAR SHIFT AND FLYWHL CLUTCH CTRL						X					X									D8		EA	1
8320211690	281690 COLLAR CLUTCH STARTING ENG						X					X									D7		EA	1
8320211842	281842 GASKET STARTER PINION START ENGINE					X	X					X									D7		EA	1
8320211849Z	281849 SHAFT TRANS AND STRG PINION STARTNG ENG					X	X					X									D7		EA	1
8320211850	281850 GASKET TRANSMISSION STARTNG ENGINE					X	X					X									D7		EA	1
8320211864	281864 LOCK CLUTCH AND STRT PINION STARTNG ENG	X	X	X	X	X	X	X	X	X	X	X	X	X	X						D7		EA	1
8320211866	281866 FORK TRANS AND STRTR PINION STARTNG ENG					X	X					X									D7		EA	1
8320211869	281869 SEAL STARTER PINION STARTNG ENGINE					X	X					X									D7		EA	1
8320211871	281871 SHAFT AND FORK ASSY TRANSM STARTNG ENG					X	X					X									D7		EA	1
8320211885	281885 SLEEVE STARTER PINION START ENGINE					X	X					X									D7		EA	1
8320211947	281947 SHIM FINAL DRIVE						X					X									D8		EA	1
8320211992	281992 STUD 5/8 X 5 3/4 IN NC BOTH ENDS																				I3		EA	1
8320212236	282236 CAP CYL BLOCK AND CYL HEAD STARTNG ENG	X	X	X	X	X			X	X	X	X	X	X	X						D3		EA	1
8320212404	282404 CLIP 1/4 IN TUBE WITH 3/8 BOLT HOLE																				I3		EA	1
8320212414	282414 PACKING STOCK CRANKSHAFT 1 OUNCE ROLL	X	X	X	X	X	X	X	X	X	X	X	X	X	X						D2		EA	1
8320212708	282708 RACE OUTER CRANKSHAFT START ENGINE					X	X					X									D6		EA	1
8320212713	282713 PLUG CRANKSHAFT STARTNG ENG					X	X					X									D6		EA	1
8320213068	283068 SCREW RETAINER BRAKE SPRING						X					X									D8		EA	1
8320213146	283146 CHAIN DRIVE TANDEM DRIVE HOUSING			X						X											I0		EA	1
	283372 SUPERSEDED BY 283376																							
8320213376	283376 YOKE ASSY FLYWHEEL CLUTCH RELEASE						X					X									D8		EA	1
8320213708	283708 CHAMBER ASSY PRECOMBUSTION CYL HEAD					X	X					X									D3		EA	1
	284011 SUPERSEDED BY 8F9271																							
8320214219	284219 SPACER OR WASHER STARTING ENGINE					X	X					X									D6		EA	1
8320214602	284602 PLUG PIPE 1/8 IN SLOT HEAD																				I3		EA	1
8320215886	285886 BUSHING 7/8 IN LONG											X									D8		EA	1
8320215887	285887 BUSHING 3/4 IN LONG											X									D8		EA	1
8320216005	286005 SEAL OIL CRANKSHAFT STARTNG ENGINE		X				X		X		X										D6		EA	1
8320216040	286040 SEAL OIL WATER PUMP					X	X					X									D8		EA	1
8320216043	286043 PIN BRAKE						X					X									D8		EA	1
8320216463	286463 GASKET CYL BLOCK AND COVERS					X	X					X									D2		EA	1
8320217109	287109 GUIDE CYL HD AND VALVE MECH						X					X									D3		EA	1
8320217111	287111 PACKING TUBE CYL HEAD AND VALVE MECH						X					X									D3		EA	1
8320217115	287115 SPRING TUBE CYL HEAD AND VALVE MECH						X					X									D3		EA	1
8320217199	287199 KEY 21/64 X 21/64 X 1 3/8																				I3		EA	1
8320217453	287453 PIN CLUTCH AND START PINION STARTNG ENG	X	X	X	X	X	X	X	X	X	X	X	X	X	X						D7		EA	1
8320217484	287484 PACKING STOCK INLET MANIFLD																				I3		FT	1
8320217556	287556 CORK NO 1 5/16 IN SMALL DIA X 5/8 LONG																				I3		EA	1
8320217557	287557 CORK NO 2 3/8 IN SMALL DIA X 11/16 LG																				I3		EA	1
8320217558	287558 CORK NO 4 1/2 IN SMALL DIA X 13/16 LG																				I3		EA	1
8320217855	287855 PLATE RH FINAL DRIVE						X					X									D8		EA	1
8320217862	287862 RING FINAL DRIVE						X					X									D8		EA	1
8320217909	287909 NUT FINAL DRIVE						X					X									D8		EA	1
8320217986	287986 FORK ASSY GRADER CTRL SHAFT 1 5/16 SQ		X							X	X										I0		EA	1
8320218293	288293 SEAL CYL HD AND VALVE MECH						X					X									D3		EA	1
8320218335	288335 NUT CASTLE 7/8 IN NF																				I3		EA	1
8320218351	288351 SHAFT STARTER PINION STARTG ENGINE																				I7		EA	1
8320218756	288756 CAGE BEARING STEERNG CLUTCH														X						D8		EA	1

11 International Petroleum Company Limited JANUARY 1956

The letter codes at the top of each catalog page (above) indicate the equipment models to which the various items of spare parts apply. The stock-class preface sheet (below) is the key to coding for Caterpillar interchangeability which is similarly provided for other types of parent equipment.

STOCK CATALOG

Stock Number	Description	Unit	Location

CATERPILLAR PARTS

KEY TO PARTS INTERCHANGEABILITY CODE TALARA

CODE	MODEL	SERIAL NUMBERS	USED ON
A	D4600 POWER UNIT	4H8001 TO 4H9000	BAY CITY POWER SHOVL
B	12 MOTOR GRADER	9K1 TO 9K9999	
C	D4600 POWER UNIT	1N1 TO 1N758	CATER MARINE ENGINE
D	D8800 POWER UNIT	1N8001 AND UP	CATER MARINE ENGINE
E	D8 TRACTOR	8R1 TO 8R9999	
F	D4400 POWER UNIT	1S1 TO 1S5000	BUCYRUS ERIE SHOVEL
G	D315 POWER UNIT	9S5001 AND UP	THEW LORAIN SHOVEL
H	D4 TRACTOR	5T1 TO 5T7411	
I	12 MOTOR GRADER	8T1 AND UP	
J	212 MOTOR GRADER	1U1 AND UP	
K	D8 TRACTOR	2U1 AND UP	
L	D4 TRACTOR	6U1 AND UP	44 IN GAUGE TRACTOR
M	D4 TRACTOR	7U1 AND UP	60 IN GAUGE TRACTOR
N	D315 ELECTRIC SET	4V1 AND UP	
O	46 HYDRAULIC CONTROL	2W1 AND UP	D8 TRACTOR
P	44 HYDRAULIC CONTROL	6W5001 AND UP	D4 TRACTOR
Q	8S BULLDOZER	8A1001 TO 8A4730	D8 TRACTOR
R	8A BULLDOZER	18C5001 AND UP	D8 TRACTOR

the symbols system, a training program had been instituted for operators, department heads, and materials and accounting personnel using charts, visual aids, and conferences in both Spanish and English. One result of this early effort was the forestalling of the usual opposition which accompanies radical changes in methods and procedures. In other words, the "selling" job was done well in advance, which insured a fairly smooth transition from a manual to a mechanized system. In fact, so effective was this approach that real enthusiasm for the new system had been created by the time it was placed in operation.

In the overall picture, International feels it now has through its mechanized materials catalog a comparatively inexpensive and simplified symbols system of selective materials control, applicable to dispersed operations, under which the cost of acquiring materials and the cost of maintaining stocks can be more effectively equated. At the same time, improved stock turnover rates and reduced stockouts are contributing to a clean and increasingly efficient materials operation. As a matter of fact, International's decision to install mechanized materials methods had the early impressive result of reducing the number of stock items, for which stock cards were formerly maintained, from 155,200 to 100,000. This will lead to an eventual inventory reduction of more than $2 million. Further studies, making use of the new mechanized facilities, are planned in standardization and detailed analyses of stocks by individual stock classifications. An estimated additional reduction of at least $1 million is expected from these studies. END

F. W. Phillips (right) and J. R. Decker confer on cataloging matters. Mr. Phillips was cataloging project manager throughout its duration. Mr. Decker, who is stationed at Talara, is cataloging coordinator for International's materials operations in Colombia and Peru.

MATERIALS CLASSIFICATION

CLASS	DESCRIPTION
00	Unassigned
01	Commissary—Foods
02	Commissary Resale Articles (Excluding Food)
03	Personal, Commissary, and Club Direct Charge Materials
04	Fire Fighting and Security Equipment and Supplies
05	Unassigned
06	Camp Equipment and Supplies, N.E.C.
07	Office and Office Services, Supplies and Parts
08	Unassigned
09	Laboratory Equipment and Supplies
10	Hospital Equipment, Supplies, Medicines, and Drugs
11	Chemical and Cleaning Compounds
12	Books and Periodicals, Excluding School Books
13	Textiles, Rubber and Leather Products, Excluding Wearing Apparel
14	Greases, Oils, Waxes, Fuels, Animal Fats, Misc. Petroleum Products, and Sundry Lubricants
15	Paints, Varnishes, and Other Protective Coatings
16	Explosive and Blasting Articles
17	Containers and Seals, N.E.C.
18	Rope, Cordage, Chain (Excluding Power Transmission), and Tackle
19	Hose, Hose Fittings, and Accessories, Excluding Drilling, Welding, and Fire Hose
20	Bolts, Nuts, Screws, Washers, Nails, Studs, and Sundry Fasteners
21	General Hardware
22	Safety Articles and Company Issued Clothing
23	Unassigned
24	Welding, Brazing, Lead Burning, Metallizing, and Soldering Equipment and Supplies (Including Tools)
25	Unassigned
26	Metal Basic Products
27	Insulation (Hot, Cold, and Accoustical), Refractories, and Acid Brick
28	Electric Wire and Cable (Excluding Automotive) and Electric Insulating Articles (Including Cathodic Protection)
29	Motors, Generators, and Exciters, Excluding Automotive
30	Motor Starters, Contactors, Controllers, and Control Equipment, Including Accessories
31	Power Distribution and Transmission Equipment, and Pole Line Articles
32	Conduit and Conduit Fittings
33	Wiring Devices and Accessories
34	Lighting Fixtures and Accessories, Lamps, and Related Articles
35	Communication and Electronic Equipment
36	Unassigned
37	General Construction Bulk Supplies
38	General Construction Articles Other Than Bulk
39	Plumbing Equipment, Fixtures and Parts
40	Water Treating, Purification Equipment, and Supplies
41	Tanks and Accessories
42	Air Conditioning and Commercial Refrigeration Equipment
43	Plant Machinery and Equipment N.E.C.
44	Geological, Geophysical and Exploration Equipment
45	Derricks, Drilling Machinery and Accessories
46	Drilling and Coring Tools, Parts and Accessories
47	Cementing and Mud Equipment, Tools, and Supplies
48	Drilling Bits and Parts
49	Fishing and Perforating Tools, Accessories and Parts
50	Oil Country Tubing
51	Casing
52	Drill Pipe and Tool Joints
53	Nipples and Couplings for Tubing and Casing
54	Steel Pipe, Including Line Pipe
55	Pipe, N.E.C.
56	Metallic Tubing
57	Pipe and Tubing Fittings, Flanges and Piping Specialties
58	Valves and Cocks, Excluding Control Valves
59	Industrial Instruments, Including Regulators and Controllers
60	Well Head Assemblies
61	Production Equipment, Supplies and Parts
62	Unassigned
63	Refinery Equipment, Spares, and Ingredients
64	Process Manufacturing Supplies
65	Marketing Articles
66	Reciprocating Pumps
67	Slush Pump Common Parts and Accessories
68	Centrifugal and Rotary Pumps
69	Miscellaneous Pumps, N.E.C.
70	Gaskets and Packing, Including Oil Seals
71	Boilers and Accessories
72	Turbines (Steam and Gas)
73	Engines (Steam)
74	Gas and Gas Diesel Engines, Excluding Cooper-Bessemer
75	Gasoline Engines
76	Diesel and Oil Engines
77	Cooper-Bessemer
78	Compressors (Natural Gas), Excluding Cooper-Bessemer
79	Compressors (Excluding Natural Gas and Refrigeration) and Air Brake Systems
80	Unassigned
81	Engine and Pump Accessories and Supplies
82	Budget Purchases (Direct Charge)
83	Caterpillar
84	Construction and Road Building Machinery Equipment and Accessories
85	Hoisting, Conveying, and Materials Handling
86	Automotive Vehicle and Body Spare Parts, Excluding Ford
87	Ford
88	Vehicles, Other Than Automotive
89	Garage and Service Station Equipment, and Common Automotive Articles
90	Lubricating Equipment and Fittings, and Spare Parts
91	Tools (Hand and Portable Power) and Spare Parts
92	Power Transmission Articles, Excluding Bearings
93	Bearings
94	Aircraft Servicing Articles, Accessories and Spare Parts
95	Marine
96	Railway
97	Temporary Stock Numbers for articles that are not to be cataloged and are to be cleared from stock as quickly as possible
98	Temporary Stock Numbers for line items on direct charge purchase requisitions (for purposes of on-order records only)
99	Temporary Stock Number for new articles that are to be regularly stocked and that are awaiting assignment of permanent stock numbers

TAPLINE'S SIDON TERMINAL

By Captain A. A. Brickhouse, Jr.*

The growing size of tankers, now passing into the "Mammoth" class, has focused attention on terminal facilities around the world capable of accommodating them. One of the world's most efficient and modern terminals, capable of caring for any tanker which may call, is the Sidon terminal of Tapline. It is described here by its superintendent, in charge of its operations for the past five years.

THE story of Tapline is a many faceted one. From Qaisumah, Saudi Arabia, the Trans-Arabian Pipe Line Co.'s 30-in. to 31-in. crude line first threads its way through the gravel plains and sands of one of the world's most desolate desert areas. Then, from the Saudi Arabian frontier, it traverses arid Jordan and the bleak plains of Syria, finally crossing the eroded ridges of Lebanon's Litani River valley near the ruins of historic Beaufort Castle and within the shadow of Mount Hermon to reach the Mediterranean, 754 miles from Qaisumah, in a story-book setting just south of the ancient Phoenician port of Sidon.

History, geography, difficult terrain, natural beauty, unusual wind and weather conditions, and a high degree of engineering and operating initiative have combined to give Tapline a position unique in the world petroleum industry.

From Qaisumah, where it receives its crude from the gathering system of the Arabian American Oil Co., Tapline currently pumps by means of four stations located at approximately 180-mile intervals in Saudi Arabia about 345,000 b/d to its Mediterranean terminal—an open-roadstead model of efficiency and new techniques designed to meet loading conditions experienced in few other places in the world.

Here, through extensive use of instrumentation and the latest labor-saving devices, only seven men are required to handle all shore operations on each shift. They include a shift foreman, tank-control operator, gauger, powerhouse operator, shore-control operator, pumper, and cargo inspector.

As a result of an intensive training program which is in line with the company's fixed policy of doing everything possible to aid the economic and social advancement of the areas in which it operates, Tapline has been able to develop a highly efficient staff of Lebanese nationals. Each employee, as he gains proficiency in his job, is rotated to other jobs until he is familiar with all phases of terminal operations. In addition, each employee is trained in oil-fighting techniques.

At Tapline's terminal, the incoming oil is funneled into a 20-unit tank farm with a maximum capacity of 3,600,000 bbl and a normal high operating level of 3,500,000 bbl. However, an attempt is made to maintain normal terminal stocks at about 1,000,000 bbl, which is considered as average safe storage.

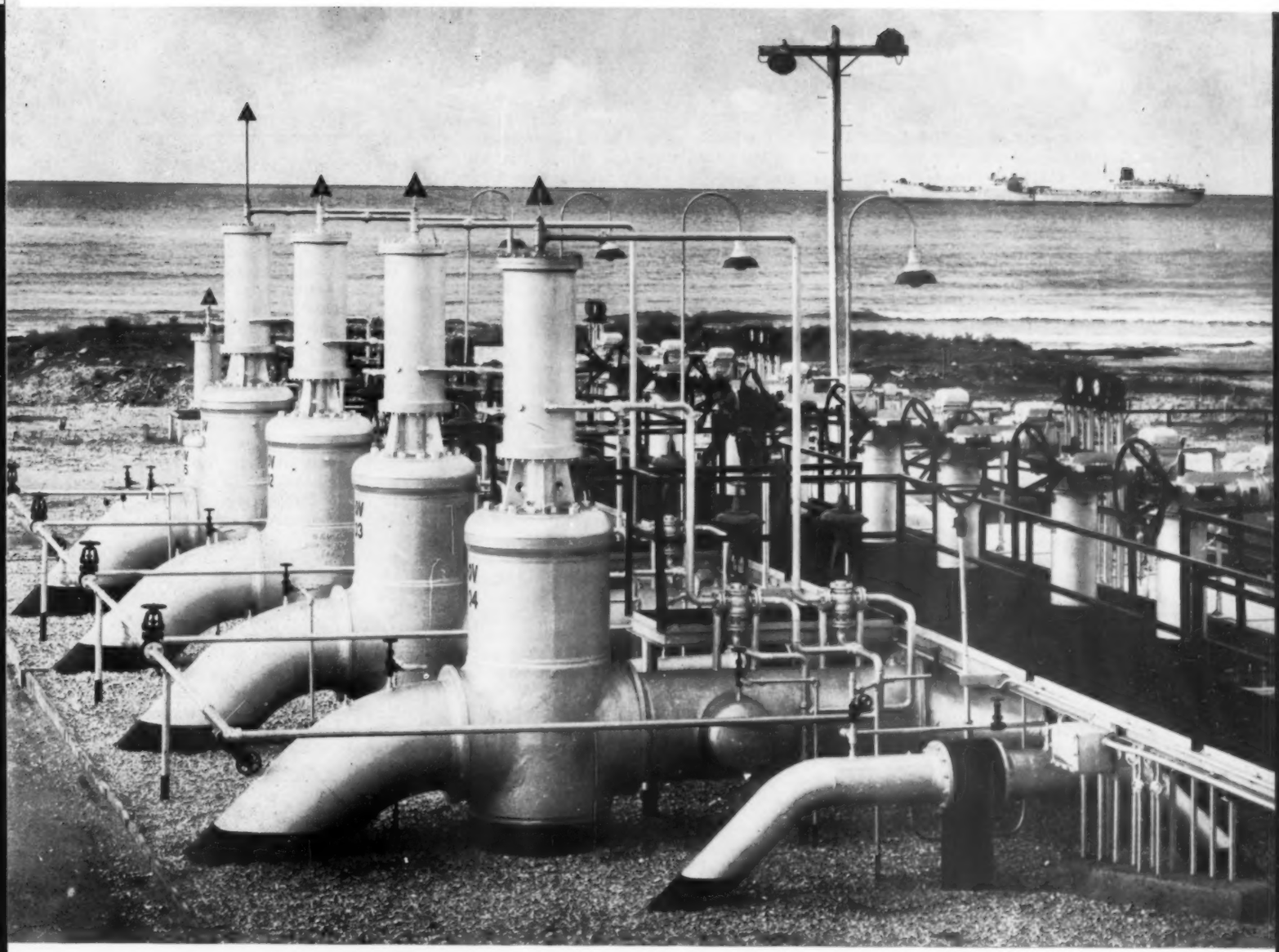
*Superintendent, Sidon Terminal, Trans-Arabian Pipe Line Co.

The following statistics give some idea of the complexities of the terminal operation:

Total length of crude lines: 23.16 miles.
Total length of bunker lines: 12.18 miles.
Total length of all lines: 35.34 miles.
Total crude line fill: 80,732 bbl.
Total fuel-oil line fill: 7,535 bbl.
Total terminal line fill: 88,267 bbl.

Incoming oil is pumped from Turaif, the last of the pump stations in Saudi Arabia, located 246 miles to the east at a 2,719-ft elevation, over the plains of Syria and Jordan and the mountains of Lebanon. At normal flow rates, the pressure of the oil stream entering the terminal is maintained at about 430 psi to keep the line filled as it passes over the mountains. This means that line pressure over the mountains can always be controlled and held slightly above atmospheric pressure to prevent creation of large gas pockets in the line which might result in uncontrollable pressure fluctuations or surges. At reduced flow rates, the terminal back pressure is raised and reaches 960 psi when flow stops.

Pressure of the incoming stream is controlled by means of a "harp." This "harp," or pressure-reducing station, was designed under the guidance of the late Harry Britton, executive vice president. As the oil



As a supertanker loads one mile offshore at berth No. 1, the raised position of indicator No. 1 on the large hydraulic valves (left) indicates that the appropriate valve is open. These hydraulic valves can be closed by line pressure during loss of power or other emergency. The smaller, electrically operated valves (right) are used to control the loading rate and can be operated manually in case of necessity.

Captain A. A. Brickhouse, Jr., superintendent of the Sidon terminal, has been with the Trans-Arabian Pipe Line Co., its affiliated and owner companies, since 1937. From 1947 until transfer to Tapline in 1951, he was assistant superintendent of marine operations for the Arabian American Oil Co. at Ras Tanura, Saudi Arabia. He has also been a relief captain of The Texas Co.'s tanker fleet. During World War II Captain Brickhouse served in the US Naval Reserve in both the Atlantic and Pacific theatres, and was an instructor in navigation, mathematics, and maritime law at the Merchant Marine Officers School, Fort Trumbull, New London, Conn. He was released from active duty in 1946, with the rank of lieutenant commander. He is a native of Norfolk, Va.

The 180,000-bbl storage tanks in the tank farm of Tapline's Sidon terminal are located on a hill, approximately 350 ft above the Mediterranean Sea—permitting the crude oil stored there to flow by gravity to the tanker berths.

enters the "harp," it is divided into 12 smaller streams, each passing through a control valve and a friction tube. The 12 streams then are joined again and enter the tank-farm manifold which directs flow into the desired tanks.

Each of the 12 assemblies in the "harp" consists of one double-seated air-operated control valve followed by 40 ft of 3-in. pipe containing a nest of seven 1-in.-diameter stainless-steel tubes. Three of the assemblies are controlled automatically by a back-pressure controller connected to the incoming line, the set point of which is adjusted remotely by the operator in the control house. The remaining nine assemblies are simply opened or closed remotely by the operator as the situation requires to hold the valves on the three automatic assemblies between 40% and 70% open.

The value on each of these automatic assemblies is provided with a position indicator located in the control house. In the course of the start-up procedure, when these valves reach 70% open position, the operator opens an additional nonautomatic assembly—thus dividing the flow and bringing the three automatic assemblies back into their normal control range.

The crude-oil tank farm is on a bluff approximately 350 ft above sea level. This permits the oil to flow by gravity from the tanks through the short-control manifold and submarine pipelines and loading hoses to five tanker berths about a mile offshore.

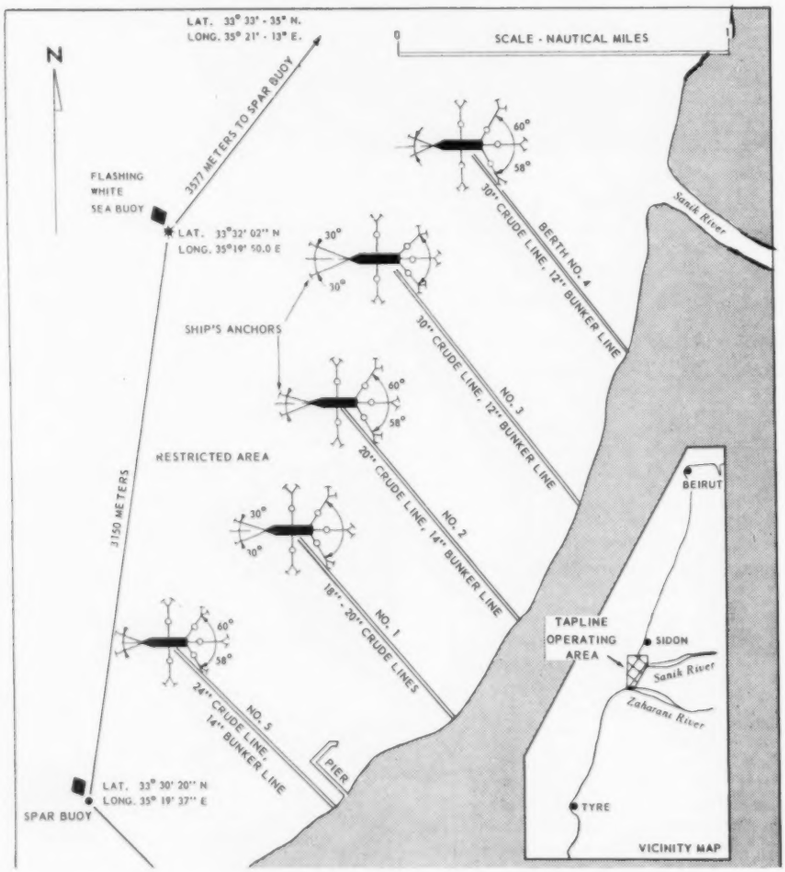
Flow to the tankers is controlled at the shore manifold. Five crude lines run from the tank-farm manifold to the short-control manifold. At the shore manifold, each of the five lines is equipped with an hydraulically operated gate valve in series with and upstream of two parallel motor-operated plug valves. The hydraulically operated gate valve provides emergency shutoff of the stream entering the tanker. These valves are remotely controlled by two air-operated three-way control valves. These, in turn, bleed pressure off the top of the piston in the hydraulic valve and simultaneously supply pressure underneath the piston to raise it and open the gate valve. The hydraulic valve closes when air is released from the three-way control valves, or if the air supply fails.

The two plug valves on each berth line are 16-in. Merco-Nordstrom valves operated by Limitorque motors. One of these plug valves can only be fully opened or closed remotely by the operator. The second plug valve is equipped with a Synchrotie position indicator on the shore-control board, and the operator can hold the valve by remote control in any position from zero to 100% open. The operator varies the flow rates as requested from the tanker by operating the plug valves. A pressure recorder for each berth is located on the shore-control board, enabling the operator to note

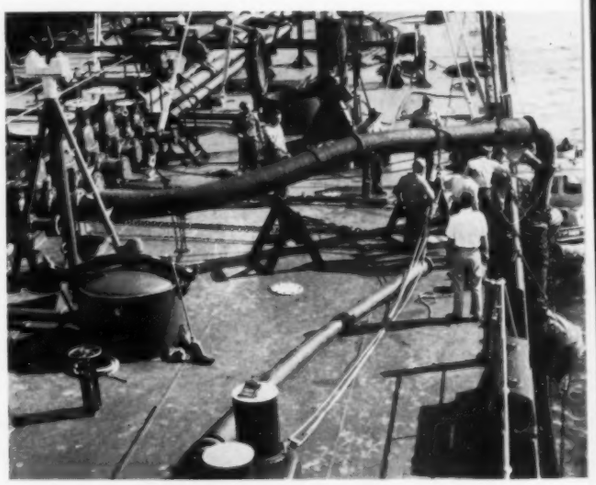
OFFSHORE LOADING ADVICE

Since it began operations, Tapline has consistently endeavored to persuade the operators of ships calling at Sidon to equip their vessels properly for open-sea loading berths. Some factors are:
1. Separate ballast tanks which will permit loading to begin as soon as the hose is connected.
2. Equipment aboard ship which will permit a high rate of loading without back pressure from the vessel restricting the flow. For example, the largest tanker handled loaded at only 18,000 bbl per hour, while many T-2's have loaded at 25,000 bbl per hour.
3. Adequate mooring equipment.

This last is extremely important. Ships loading in an unprotected port must have good ground tackle (anchor and anchor chain), and it must be in first-class condition. Ships up to 28,000 dwt should have at least 10 shots of anchor chain (900 ft), and the new larger tankers should have more. Larger tankers will need as much as 15 shots of chain (1,350 ft) to each anchor.



Mooring Layout: Sidon oil loading terminal south of the town of Sidon—Lebanon.
Important: This map is not to be used for navigation.



A tanker "hoses up" for loading at the Sidon terminal. A 12-in. rubber hose connects the ship's manifold with the 12-in. submarine hose, 200 ft long, which in turn connects with an under-water crude-loading pipeline. Most berths are also equipped with another submarine pipeline and hose for loading bunkers.

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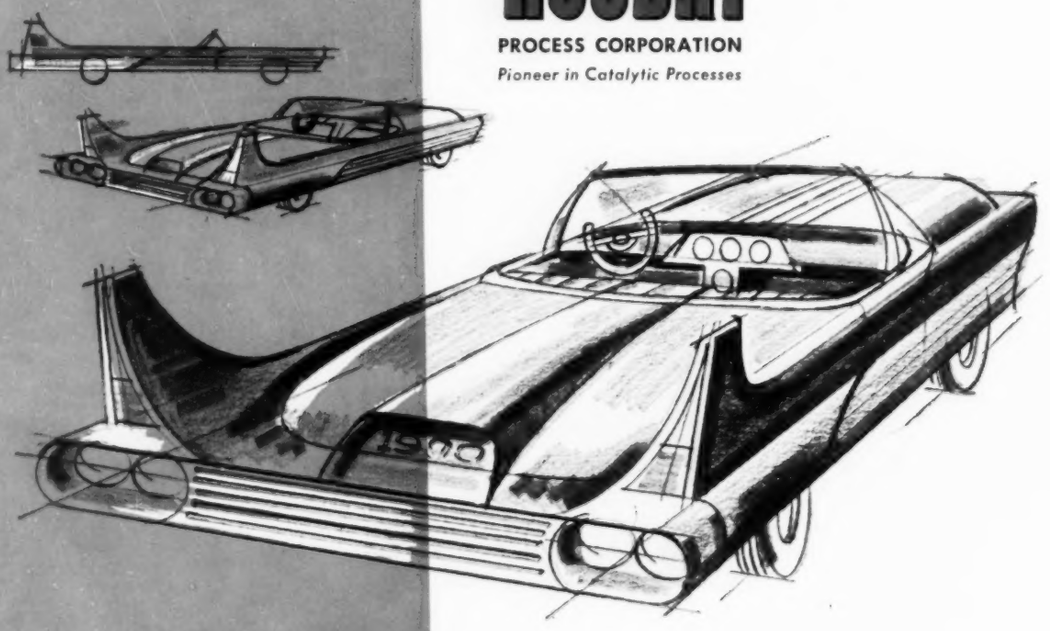
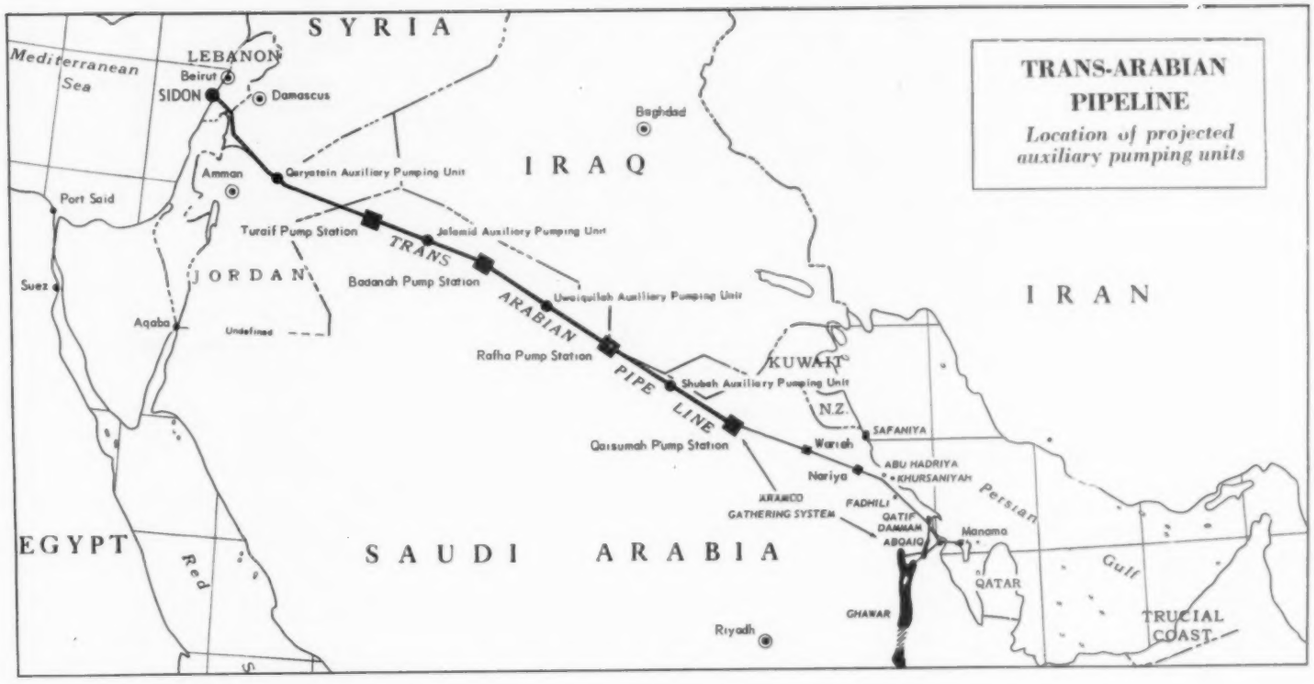




instantaneously any change in loading conditions.

Cargo lines to the tanker berths are 20 in., 24 in., or 30 in. in diameter, with eight 25-ft sections of 12-in. loading hose fitted to the end of each cargo line. One 18-in. bunker line has recently been converted to a cargo line.

Tankers calling at Tapline's terminal are moored with the bow seaward, secured by the vessel's anchors. Each of the berths is supplied with five mooring buoys, 6½ ft in diameter and 12 ft long and firmly anchored to the sea bed. Each is fitted with a pelican hook. The buoys are ranged about 500 ft from the shop to take two breast lines, two stern quarter lines, and a stern line. This system results in a somewhat flexible mooring so there will be a certain amount of "spring" to the ship in swells.

Tapline uses 14 mooring masters—all former tanker captains—to advise the ship's master on all matters regarding moving and loading. The ship is brought into the berth with the aid of large target panels onshore. For night berthing, these panels are lighted. The tanker is maneuvered so that its loading connections will center in a theoretical circle, 25 ft in diameter, over the loading hoses. In rough weather this calls for a high degree of seamanship and teamwork between the mooring master and the launches which carry the ships' lines to the mooring buoys.

Tapline operates seven launches from a small man-made *L*-shaped harbor in the terminal area. These launches are all manned by Lebanese whose excellent seamanship, in the tradition of their Phoenician ancestors, is recognized throughout the world.

The hooking-up process begins immediately after mooring. The cargo and bunker hoses, resting on the sea bed, are marked by separate buoys at each berth. The launch picks up the line to the cargo hose and passes it to the tanker crew which hoists the hose to a point somewhat above the deck. The launch crew then passes an elbow joint and additional hose to the tanker to secure the loading hose to its manifold. A similar procedure is followed if bunkers are needed.

For periods of rough weather, the Tapline staff has developed a unique quick-release mechanism which will permit a tanker to drop its loading hoses in less than 60 sec in emergencies.

Tapline maintains, on a 24-hour operating basis, LF and HF radiotelegraph and VHF FM radiotelephone facilities for communicating directly with tankers at sea destined for loading and with tankers in berth or berthing.

Through these facilities the ships are able to give ETA information 72, 24, 12, and 2 hours in advance of their arrival. Thus, notice of order of loading, berthing, general information, terminal weather conditions, and technical questions are settled in advance and terminal personnel alerted for the ship arrivals.

All launches are provided with VHF FM radio transmitter-receivers and the mooring masters carry with them VHF portable units when boarding a ship. During berthing and loading operations these VHF FM radiotelephone harbor-control facilities provide highly reliable liaison and control communications between ship and shore, allowing maximum use of the terminal loading facilities.

Tapline was one of the first, if not the first, to provide this complete all-radio control of ship arrival, berthing, loading, and departure at a marine oil terminal. In addition the Tapline terminal is the western terminus for the pipeline dispatching and general purpose HF radiotelephone and radio-teletype circuits.

The company's headquarters in Beirut, 30 miles to the north, and the terminal are connected by a duplex VHF carrier teletype circuit. This circuit carries all cable traffic regarding ship nominations and terminal operations plus terminal loading information, lifting cables, ship ETA's from the

TAPLINE LOADING DATA

	1951	1952	1953	1954	1955	1956
Average b/d lifted at Sidon	298,768	309,274	311,183	318,823	311,631	320,826
Total number of cargoes	920	992	926	898	843	827
Average barrels per tanker	118,533	114,107	122,658	129,588	134,929	141,986
Most b/d lifted at Sidon	782,018	1,081,067	1,109,796	896,029	1,062,286	922,406
Average bph loading rate per berth	14,500	15,114	16,480	18,372	18,590	18,964
Hours port closed by weather	500	605	836	696	412	1,045½
Approximate port operating hours	16:30	14:00	14:00	13:00	13:30	13:30
Approximate delays	13:30	3:30	1:30	5:00	4:30	6:30
Approximate average time in port	30:00	17:30	15:30	18:00	18:00	20:00

radio message center at the terminal, and such other miscellaneous traffic for which a written record is required.

As a navigational service for ships at sea destined for Sidon, Tapline operates a low-frequency marine radio beacon on a continuous basis. These communication facilities—which provide the channels for control, liaison, and safety—are an important factor in the high operating efficiency of the terminal.

Weather has always been an important element in Tapline's terminal operations. Situated at the base of a mountain range, where some peaks reach 10,000 ft, in relatively shallow water (the depth of the deepest berth is 60 ft), the tapline roadstead is often subject to sudden and severe storms. Although the winds are usually from the west, they can shift with astonishing rapidity, especially in the winter months, and a ship's mooring facilities must be adequate to withstand them. Sudden storms are particularly prevalent during the months of January, February, and March. Despite this, the port has a low incidence of closure because of weather conditions. Since its opening in December 1950, the terminal has been closed only 4,361 hours, or an average of about 30 days a year.

In 1956, the weather factor was the worst in Tapline's history. The port was closed 46 times, but the average closure was for less than 22 hours, and the longest 100 hours. Safety factors are, of course, always given primary consideration in any decision to close the port. However, with careful tanker scheduling, the maximum number of tankers held in port by weather during any one day was only seven. The flow through the pipeline never was slowed because of lack of storage in the tank farm, since the capacity of the tankage never was reached.

Since the start of operations, Tapline has loaded over 700 million barrels of crude through its submarine lines to its offshore berths. In a single 24-hour period it has put as much as 1,200,000 bbl aboard vessels. In 1951, with an average delivery to ships of 298,768 b/d, the average cargo was 118,533 bbl and was lifted by 920 tankers. In 1956, the average delivery to ships was 320,826 b/d, and the average cargo was 141,986 bbl which was lifted by 827 tankers (see table).

So far, Tapline has moored and loaded over 5,700 tankers ranging in size from 5,000 dwt to 39,000 dwt. Tapline feels that it has compiled an impressive record of operations in its less than seven years of existence, and it looks to the future to give it an even more important role to play in the world oil picture.

By early 1958, the company expects to have completed a capacity increase program which will step up its present daily average through put by about 90,000 bbl. This capacity increase is being achieved in two steps, as follows:

1. A radio-controlled auxiliary pumping unit, driven by a 5,000-hp General Electric combustion gas turbine, will be installed at each of three intermediate locations between existing pump stations in Saudi Arabia, and a new station incorporating a combustion gas turbine will be built in Jordan. These units will be started or stopped by means of a VHF radio link with the existing upstream station. A similar unit will be installed at Turaif, westernmost of the pump stations, to meet additional horsepower requirements.

2. Supplemental booster pumps, totaling 1,200 hp, will be installed at each of the other three pump stations to raise the pressure entering the present main-line pumps.

Meanwhile, extensive preparations are now under way at the terminal to improve and speed up loading facilities. At present, Tapline can load at rates up to 30,000 bbl per hour, with the actual loading rate depending pretty much on the individual tanker's equipment. Vessels now calling at the terminal average 7½ hours to load, and up to 18 hours in port. It is expected that the new and larger supertankers will be equipped to load at rates of 40,000 bbl per hour. Tapline will be able to provide this rate, when needed, by the use of larger hose and looped lines.

The "supers" will require about the same average time in port as most of the vessls now being loaded, except in the case of the very largest vessels when a somewhat longer loading period will be necessary. For instance, at a 40,000 bbl-per-hour rate, the largest of the supertankers, a 100,000-tonner, with a 750,000-bbl load capacity, could be loaded in 18¾ hours.

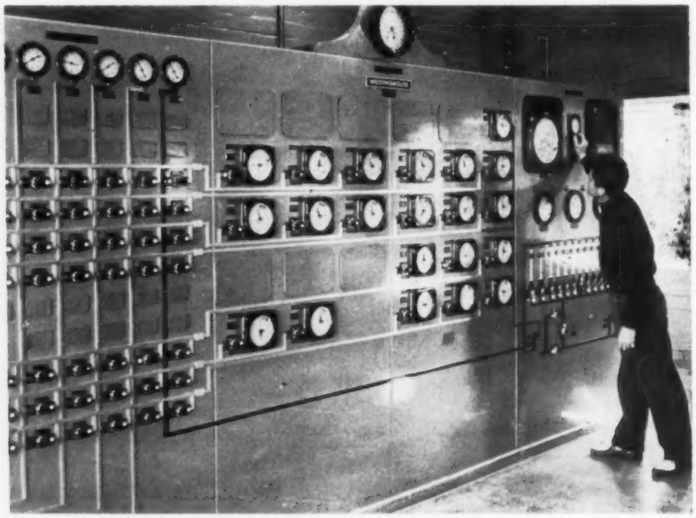
In addition to the use of larger hoses and looped lines Tapline's plans for meeting the trend toward bigger and bigger tankers calls for the installation of additional mooring buoys of the floating-cylinder type. They will be the same as the buoys presently in use, except that they will be built to withstand a pull of 200 or more tons as against a present 100-ton pull.

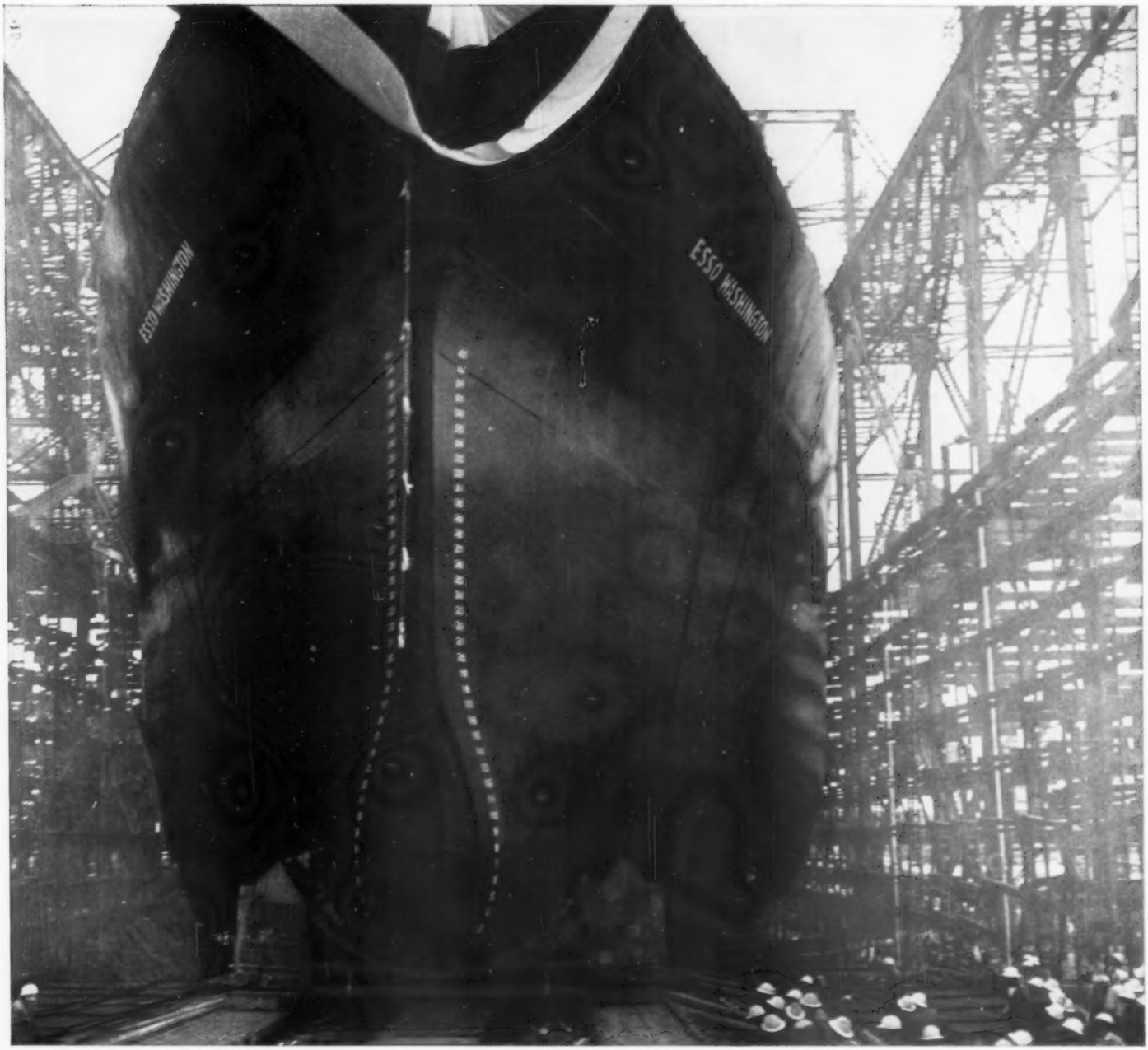
Tapline's terminal staff is not concerned so much with the size of the vessels it has to load as it is with the equipment the ships carry. It believes that builders of every large tanker should include provisions for safe and efficient handling at submarine berths. While Tapline feels it can handle any tanker which is nominated in the ordinary course of business, the company reserves the right to refuse to load a vessel which it considers to have insufficient equipmen'.

In any event, Tapline is fully prepared for the new era of supertankers. It has the throughput, and it is confident it has the equipment, the personnel, and the know-how. END

In control room of terminal's tank farm, Lebanese operator George Asmar makes an adjustment by remote control on the back-pressure control system (right). Gauges (center) indicate amount of oil in each storage tank. Manifold controls (left) indicate pressure on each line, and contain remote-control switches for opening and closing the various valves.

In the shore-control room at the Sidon terminal, Nicola Khoury, a Lebanese operator, inserts a pressure-recorder chart on the control panel. Through an intensive training program, Tapline has developed a highly skilled staff of Lebanese nationals.





13 MILLION GALLONS BIG...BUT JUST A DROP IN THE BUCKET

THE ESSO WASHINGTON is the newest of the 110 ocean-going tankers in the Esso fleets. She can carry 13 million gallons of oil. But that's just a drop in the bucket compared with the 40 billion gallons that Jersey Standard affiliates delivered to customers last year.

As economies expand . . . as populations grow . . . as people live better, oil must provide more energy to power factories, to drive ships and planes and motor vehicles, to heat and light homes and offices. Last year we supplied more than twice the oil we did ten years ago. This year our customers will need still more.

It's a big job . . . and it requires vast amounts of costly equipment. As our Annual Report points out, we spent $1,083,000,000 last year searching for oil and gas and paying for such things as tankers, pipelines and refineries. And in 1957, we plan to spend another $1,250,000,000 to find, produce and deliver the oil people will be needing tomorrow . . . and ten and twenty years from now.

Because Jersey Standard is willing and able to make such investments and because our operations are efficient, we make a profit. In 1956 it was $808,535,000. About half of it went back into the business to help pay for the new facilities.

Our successful year was good news for the 403,000 shareholders who own the company . . . they got dividends of $2.10 per share on the money they invested.

It was good news for our 156,000 employees . . . whose wages and benefits came to $906,000,000.

It was good news for governments. Operating and income taxes, import duties, consumer taxes and other payments from our operations brought to the United States and other governments a record $2,171,000,000. That was five times the dividends to shareholders, more than double the payroll and benefits to employees.

Best of all, our operations were good news for the people of the free world, who rely heavily on the energy of oil for their economic and social progress.

In this, our 75th anniversary year, we intend to continue our efforts to remain successful, profitable and growing, in order to serve people well.

If you would like a copy of our 1956 Annual Report to shareholders, please write us at Room 1626, 30 Rockefeller Plaza, New York 20, N. Y.

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Esso 75 YEARS
producing energy for an abundant life

SHELL

The first commercial hydro-desulphurising unit applying the Shell Trickle Phase technique was commissioned at the Stanlow Refinery in April 1955. The performance of this unit has exceeded expectation.

The Spence Cobalt and Molybdenum Oxides on Alumina catalyst used was developed especially for its high selectivity, stability, and mechanical strength.

Shell Trickle Phase hydrodesulphurisation unit, Stanlow refinery. A Shell photograph.

SPENCE

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OIL COMPANY EARNINGS HIGHER

Net income of 40 USA oil companies increased 12.3% in 1956, to $3.218.1 million. In the previous year the same group of companies had earned $2,865.4 million.

The industry paid 42% of its net income to common stockholders after provisions for necessary payments on preferred stock. Dividend payments totaled $1,359.5 million, compared with $1,203.7 million the previous year. Earnings retained in the business in 1956 totaled $1,858.6 million, and 1,661.7 million the previous year.

Capital investments by the industry continued to increase at the same rapid rate as in recent years. Total in 1956 was $4,911.4 million, compared with $3,931.2 million in 1955. In addition to the funds supplied through depreciation and similar charges plus retained earnings, the industry found it necessary to obtain new money in capital markets. Funded and long-term debt increased $794.7 million, to $4,307.9 million.

A notable instance of generating capital within the company is Tidewater Oil Co., which has been financing its big new East Coast refinery and other expansion through the elimination of common-stock dividends. Net capital assets rose $146 million in 1956 and the surplus $40 million, with a rise of only $150 million in funded debt.

Net working capital of the 40 companies rose $411.3 million in 1956, to a new record of $6,564.7 million. Net capital assets, after provisions for depreciation etc., rose $2,520.2 million, to $21,195.1 million—a rise of 13.5%.

The past year was one in which a number of companies issued stock dividends. Result was that at the end of the year the 40 companies had 15.951 million shares in the hands of the public, an increase of 1,103 million during the year.

Standard Oil Co. (N.J.) was the largest contributor, with a three-for-one split—bringing its outstanding common to 197 million. Socony Mobil Oil Co. issued eight million new shares; Phillips Petroleum Co. gave a 100% stock dividend of 17 million shares; and the Texas Co. split its shares, raising the total outstanding by 27 million.

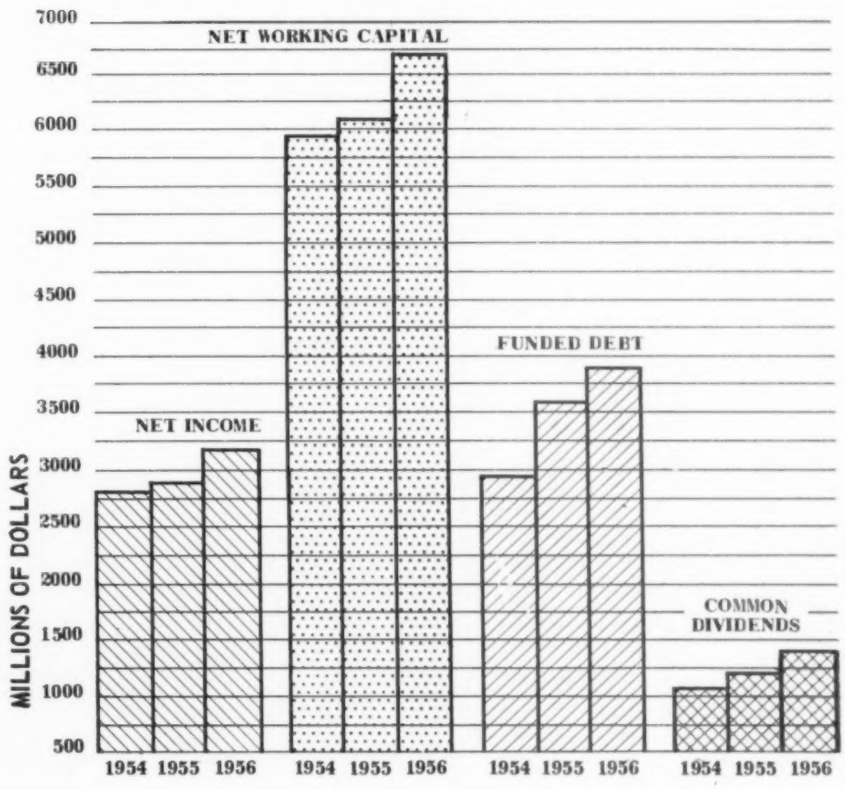
Earnings per common share on all stock of the 40 companies outstanding at the close of the year totaled $3.99, compared with $3.60 per share in 1955. In this calculation, adjustments have been made because of the stock splits mentioned.

Comparisons of significant figures from annual reports of the 40 companies are given in a tabulation to be found on the following two pages. In addition to the data on USA companies, reports are given on three companies operating largely in Latin America and two of the largest European companies.

Trends in various figures are quite similar between companies doing business largely in the United States and those doing business elsewhere. Net earnings of Latin American companies rose 15.3%, compared with 12.35% in the USA, and 13.25% in Europe. Net capital assets in the USA rose 13.5%; in Latin America 18.7%; and in Europe 15%.

FIRST QUARTER NET INCOME
(Thousands of Dollars)

Company	Net Income 1957	Net Income 1956	Per Share of Common 1957	Per Share of Common 1956
Amerada Petr.	$ 8,746	$ 7,623	$1.39	$1.21
Arkansas Fuel	2,235	1,907	.59	.50
Ashland Oil & Ref.	9,169	7,172	1.49	1.15
Atlantic Ref.	14,761	12,223	1.61	1.32
Aztec Oil & Gas	301	165	.13	.07
Bishop Oil	102	119	.18	.21
Champlin Oil & Ref.	3,107	2,070	.75	.60
Cities Service	23,427	18,180	2.27	1.80
Colorado Oil & Gas	690	533	.18	.13
Columbian Carbon	1,632	1,761	1.01	1.09
Continental Oil	13,640	13,794	.70	.71
Gulf Oil	94,938	71,963	3.20	2.56
Getty Oil	9,306	2,333	1.59	.38
Honolulu Oil	3,844	3,749	1.02	1.00
Humble Oil & Ref.	58,200	49,300	1.62	1.37
Imperial Oil Ltd.	21,600	19,200	.68	.64
International Pet.	11,100	9,300	.77	.64
Louisiana Land & Expl.	5,471	3,605	.61	.40
Merrill Pet.	821	704	.28	.24
Middle States Pet.	1,034	1,007	.43	.42
Midwest Oil	2,102	1,788	.83	.70
Phillips Pet.	28,379	28,332	.83	.83
Plymouth Oil	2,519	2,283	1.02	.94
Pure Oil	10,170	9,184	1.18	1.07
Quaker State	370	526	.45	.64
Richfield Oil	7,039	7,512	1.76	1.88
Seaboard Oil	3,393	2,663	.92	.73
Shell Oil	41,450	35,010	1.37	1.16
Sinclair Oil Corp.	26,302	24,246	1.72	1.68
Socony Mobil Oil	70,000	62,000	1.53	1.42
Standard of Calif.	69,473	61,494	1.10	.97
Standard of N.J.	237,000	205,000	1.20	1.04
Sun Oil	13,331	12,255	1.24	1.21
Sunray-Mid Continent	16,297	11,385	.89	.60
Suntide Ref.	863	924	.28	.30
The Texas Co.	86,424	69,958	1.57	1.27
Texas Pacific Coal & Oil	2,068	2,054	.58	.57
Tidewater Oil Co.	11,335	9,037	.82	.72
Union Oil & Gas of La.	1,710	1,238	.94	.68
Venezuela Pet.	2,210	2,276	.55	.56
Wilcox Oil	254	300	.89	1.06
Woodley Pet.	850	501	1.08	.66
TOTAL	$ 917,663	$ 776,674		



THREE-YEAR FINANCIAL REVIEW OF

	Net Income	Per Share of Common	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Anderson Prichard Oil Corp.								
1956	**$5,880,382**	**$3.41**	**$10,918,839**	**$51,328,468**	**$9,300,000**	**200,000**	**1,642,216**	**28,960,523**
1955	4,965,200	3.05	5,481,562	42,775,832	[illegible]	.....	813,433	31,792,750
1954	3,253,561	2.00	6,128,711	39,972,089	10,500,000	.....	813,433	28,454,406
Amerada Petroleum Corp.								
1956	**26,499,395**	**4.20**	**46,967,439**	**145,962,503**	.....	.....	**6,309,400**	**131,601,877**
1955	25,363,673	4.02	49,542,789	73,317,682	.....	.....	6,309,400	104,139,907
1954	19,777,648	3.13	36,778,125	68,485,369	.....	.....	3,154,700	89,817,684
Ashland Oil								
1956	**13,503,942**	**2.13**	**46,127,726**	**81,053,001**	**27,721,000**	**914,388**	**5,553,038**	**68,502,912**
1955	10,106,032	1.56	49,520,893	70,132,006	29,717,000	774,512	5,427,383	61,541,609
1954	6,628,076	.92	45,686,614	73,014,850	31,697,000	819,281	5,426,507	56,467,525
Atlantic Refining Co.								
1956	**47,210,000**	**5.11**	**123,498,000**	**478,560,326**	**147,500,000**	**352,000**	**8,970,328**	**341,632,453**
1955	39,464,000	4.25	93,493,000	413,152,000	83,400,000	352,000	8,965,774	313,630,437
1954	41,351,000	4.47	93,384,000	407,821,000	82,700,000	352,000	8,962,177	306,902,973
Cities Service								
1956	**65,832,436**	**6.03**	**379,867,824**	**673,032,656**	**459,375,103**	.....	**10,312,553**	**478,315,551**
1955	53,260,690	4.88	306,809,242	636,632,938	390,622,971	.....	10,110,347	442,510,469
1954	47,583,173	4.41	315,278,048	606,535,116	396,067,025	.....	3,964,842	475,474,423
Continental Oil								
1956	**51,817,461**	**5.30**	**106,753,447**	**308,493,737**	**109,275,880**	.....	**9,777,301**	**303,554,210**
1955	46,358,772	4.75	106,006,070	290,350,663	107,544,850	.....	9,756,466	280,400,181
1954	41,683,189	4.28	116,205,016	269,243,027	108,133,233	.....	9,746,916	261,335,498
Delhi-Taylor Oil Corp.								
1956	**2,043,368**	**.39**	**13,679,572**	**41,837,810**	**50,133,031**	.....	**5,316,842**	**12,724,905**
1955	1,646,795	.31	8,237,141	40,929,064	46,280,041	.....	5,316,842	10,701,537
1954	916,340	.17	11,197,736	43,725,336	49,143,930	.....	5,270,842	11,922,808
Getty Oil Co.								
1956	**7,887,947**	**1.28**	**16,441,857**	**53,165,286**	**39,134,064**	**1,205,807**	**5,773,815**	**68,763,056**
1955	11,182,071	1.85	20,571,570	46,704,483	38,693,110	1,285,807	5,498,876	62,489,188
1954	12,517,813	2.08	20,718,747	45,261,318	41,402,795	1,285,807	5,237,030	52,868,824
Gulf Oil Corp.								
1956	**282,658,000**	**9.54**	**393,788,000**	**1,726,746,000**	**286,271,000**	.....	**29,614,682**	**1,167,753,610**
1955	218,064,000	8.19	439,525,507	1,147,973,174	175,460,998	.....	26,628,067	862,763,310
1954	182,813,000	6.87	391,635,961	1,069,264,316	182,506,361	.....	25,533,768	725,998,653
Hancock Oil Co.								
1956	**7,079,848**	**2.02**	**27,498,597**	**12,765,568**	.....	**200,000**	**3,367,136**	**41,476,055**
1955	6,112,474	1.74	28,174,101	7,669,698	.....	200,000	3,237,631	40,603,379
1954	6,880,505	2.20	32,100,000	2,754,762	.....	200,000	3,113,107	29,747,344
Honolulu Oil								
1956	**13,816,000**	**3.68**	**13,203,000**	**61,815,000**	**1,468,786**	.....	**3,750,972**	**37,738,584**
1955	13,699,000	3.65	11,301,068	57,100,348	1,468,786	.....	3,750,972	30,298,968
1954	10,236,000	5.46	12,945,395	47,836,457	2,222,368	.....	1,875,486	40,981,022
Humble Oil & Ref.								
1956	**178,961,132**	**4.99**	**49,689,819**	**1,166,800,000**	**27,064,232**	.....	**36,000,000**	**798,127,537**
1955	174,997,500	4.88	78,133,959	1,092,523,903	23,282,042	.....	36,000,000	696,238,780
1954	146,302,700	4.08	99,658,471	981,824,052	19,918,108	.....	36,000,000	604,068,565
Louisiana Land & Exploration Co.								
1956	**13,438,505**	**4.51**	**6,454,515**	**13,595,120**	.....	.....	**2,981,216**	**17,233,548**
1955	12,929,567	4.34	5,957,541	11,550,386	.....	.....	2,979,156	14,710,652
1954	10,602,359	3.56	5,477,117	10,184,577	.....	.....	2,977,306	12,860,939
Middle States Petroleum								
1956	**1,034,094**	**.43**	**2,807,543**	**27,913,091**	**9,600,000**	.....	**2,409,058**	**12,334,953**
1955	1,006,718	.42	4,438,711	28,184,964	11,200,000	.....	2,409,058	11,466,424
1954	1,648,437	.68	2,541,835	28,687,442	12,050,000	.....	2,316,519	10,552,245
Ohio Oil								
1956	**41,215,655**	**3.14**	**73,807,023**	**239,555,629**	.....	.....	**13,126,753**	**236,798,565**
1955	41,255,462	3.14	76,889,823	219,729,223	.....	.....	13,126,753	216,585,714
1954	38,223,725	2.91	68,591,622	208,318,117	.....	.....	6,563,377	195,676,719
Phillips Petroleum								
1956	**95,202,615**	**2.77**	**173,750,416**	**1,016,487,480**	**243,446,809**	.....	**34,343,286**	**770,471,495**
1955	95,203,057	2.78	138,838,021	879,029,751	118,945,583	.....	17,142,787	443,872,017
1954	76,234,679	2.60	150,689,347	799,360,230	265,317,007	.....	14,653,120	395,701,757
Plymouth Oil								
1956	**7,956,000**	**3.22**	**17,225,000**	**55,776,358**	**18,949,103**	.....	**2,471,872**	**43,061,031**
1955	6,888,000	2.83	19,285,864	51,748,007	19,609,103	.....	2,438,399	39,260,130
1954	6,759,000	2.78	19,706,063	49,226,641	19,269,103	.....	2,432,559	31,958,995
Pure Oil Co.								
1956	**36,559,879**	**4.26**	**105,986,327**	**317,591,013**	**86,040,662**	.....	**8,583,604**	**263,064,113**
1955	35,164,226	4.05	96,019,234	298,661,239	79,582,207	.....	8,549,332	240,205,578
1954	31,163,000	3.56	89,078,649	267,134,702	31,203,136	442,434	8,137,290	220,136,681
Quaker State Oil								
1956	**1,975,257**	**2.39**	**9,040,332**	**13,101,222**	**250,000**	.....	**927,305**	**17,311,239**
1955	2,676,256	3.24	9,118,175	13,160,929	750,000	.....	927,305	16,985,982
1954	2,112,794	2.56	8,058,214	14,216,915	1,250,000	.....	927,305	15,959,726
Richfield Oil Co.								
1956	**26,573,621**	**6.64**	**73,125,446**	**199,813,469**	**78,000,000**	.....	**4,000,000**	**134,483,756**
1955	29,609,669	7.40	73,175,594	192,329,432	81,000,000	.....	4,000,000	121,910,135
1954	20,240,979	6.39	76,511,916	179,523,089	84,000,000	.....	4,000,000	106,300,687
Seaboard Oil Co.								
1956	**9,369,000**	**2.56**	**10,953,962**	**61,921,046**	.....	.....	**3,733,149**	**69,751,071**
1955	8,441,000	2.31	10,600,000	42,412,530	.....	.....	3,733,149	49,800,074
1954	7,470,307	2.04	14,345,811	35,502,405	.....	.....	3,733,149	45,905,141
Shamrock Oil & Gas Corp.								
1956	**9,007,313**	**3.92**	**10,428,133**	**54,949,841**	**24,899,500**	.....	**2,298,910**	**37,771,835**
1955	7,755,514	3.43	4,631,304	49,168,230	18,734,250	.....	2,262,232	32,607,131
1954	7,408,065	3.28	6,420,000	44,665,405	19,510,000	.....	1,502,157	24,373,219
Shell Oil Co.								
1956	**135,848,000**	**4.49**	**287,253,000**	**750,906,690**	**197,408,000**	.....	**30,286,384**	**675,905,680**
1955	125,532,000	4.14	231,254,701	728,516,144	201,457,000	.....	27,533,076	608,360,603
1954	121,127,000	4.41	178,580,115	642,256,372	137,118,000	.....	27,480,076	505,171,454
Signal Oil & Gas								
1956	**10,693,606**	**2.61**	**11,813,746**	**78,539,830**	**18,991,630**	.....	**4,099,704**	**73,862,846**
1955	9,640,400	2.46	14,433,012	68,104,396	7,547,151	.....	3,916,004	66,701,102
1954	9,313,280	2.38	9,665,642	64,791,878	6,687,980	.....	3,737,255	60,261,633

UNITED STATES OIL COMPANIES

	Net Income	Per Share of Common	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Sinclair Oil Corp.								
1956	**91,070,812**	**6.17**	**311,975,758**	**884,307,069**	**355,168,755**	.....	**15,487,555**	**847,623,736**
1955	80,709,954	6.01	231,714,070	812,893,649	248,676,951	.....	14,528,428	756,407,123
1954	74,623,256	6.05	244,419,927	762,425,552	323,186,174	.....	13,042,038	640,552,115
Skelly Oil Co.								
1956	**34,093,414**	**5.93**	**59,729,863**	**240,887,684**	**6,475,700**	.....	**5,746,117**	**155,050,219**
1955	32,240,262	5.61	49,923,625	232,029,953	8,485,000	.....	5,476,117	131,299,803
1954	29,455,250	5.12	44,422,994	216,654,592	8,818,000	.....	5,745,117	109,402,539
Socony Mobil Oil Co.								
1956	**249,503,667**	**5.70**	**590,352,161**	**1,521,202,925**	**211,417,611**	.....	**43,797,585**	**1,408,297,794**
1955	208,347,039	4.76	580,591,666	1,411,012,611	223,960,153	.....	35,512,203	1,388,429,322
1954	187,450,326	4.28	539,444,502	1,342,520,044	185,890,000	.....	35,512,203	1,267,537,453
Standard of Calif.								
1956	**267,890,801**	**4.24**	**308,584,439**	**1,394,069,804**	**76,721,925**	.....	**63,224,386**	**1,295,639,373**
1955	231,138,655	3.66	283,228,000	1,270,319,631	78,562,217	.....	31,612,193	1,132,068,809
1954	211,872,447	3.35	282,223,635	1,137,855,779	78,486,824	.....	30,106,851	1,010,067,482
Standard of Indiana								
1956	**149,430,000**	**4.33**	**460,190,000**	**1,667,135,029**	**298,900,000**	.....	**35,381,185**	**1,015,850,419**
1955	157,120,000	4.81	478,711,532	1,554,905,062	391,210,108	.....	33,057,115	874,712,182
1954	117,160,000	3.73	409,589,671	1,501,830,824	401,039,195	.....	32,467,190	762,478,653
Standard of Kentucky								
1956	**12,478,021**	**4.79**	**24,355,671**	**55,345,635**	.....	.....	**2,604,790**	**58,407,603**
1955	12,667,299	4.86	24,880,664	60,767,895	.....	.....	2,606,984	54,395,149
1954	12,385,412	4.75	23,638,689	47,804,871	.....	.....	2,606,984	50,193,418
Standard of N. J.								
1956	**808,535,000**	**4.11**	**1,650,180,000**	**4,355,137,000**	**584,996,000**	.....	**196,939,000**	**3,732,867,552**
1955	709,310,000	3.61	1,642,457,000	3,872,998,000	557,924,000	.....	65,435,000	3,698,699,781
1954	584,793,000	3.19	1,522,006,000	3,474,892,000	496,805,000	.....	65,435,000	2,203,121,263
Standard Oil of Ohio								
1956	**26,591,560**	**5.35**	**54,019,436**	**212,949,797**	**28,000,000**	**207,914**	**4,820,303**	**176,689,968**
1955	23,008,465	4.61	63,497,014	194,219,645	31,000,000	221,314	4,020,112	171,187,147
1954	18,527,085	3.68	69,330,328	178,509,626	22,856,580	220,806	4,019,762	158,689,696
Sun Oil Co.								
1956	**56,160,053**	**5.22**	**98,095,496**	**398,493,800**	**11,019,227**	.....	**10,845,051**	**90,943,321**
1955	48,307,360	4.72	78,053,664	370,655,502	9,863,150	.....	10,236,433	87,530,079
1954	40,343,791	4.17	81,074,095	342,245,561	11,832,400	93,197	9,661,720	90,857,669
Superior of Calif.								
1956	**5,040,752**	**11.94**	**21,961,800**	**137,487,557**	**81,856,598**	.....	**422,264**	**99,802,066**
1955	3,395,000	8.04	30,411,232	116,483,009	49,654,254	.....	422,264	94,761,314
1954	10,360,388	24.54	22,531,656	99,759,895	27,552,783	.....	425,014	92,632,000
Sunray-Midcontinent								
1956	**45,309,643**	**2.40**	**83,244,564**	**357,665,593**	**58,186,000**	**2,748,931**	**17,316,610**	**300,528,529**
1955	39,471,783	2.27	84,288,907	337,485,528	60,346,667	2,816,898	16,442,425	279,036,365
1954	36,728,636	2.23	117,034,018	325,104,045	76,733,333	1,164,816	12,363,450	316,350,897
The Texas Co.								
1956	**302,262,620**	**5.51**	**598,547,070**	**1,435,466,845**	**363,855,182**	.....	**55,250,496**	**468,710,006**
1955	262,729,738	4.79	538,658,293	1,215,969,460	208,968,985	.....	27,625,248	983,645,810
1954	226,140,761	4.12	474,193,629	1,137,478,374	214,903,949	.....	27,595,248	837,540,696
Texas Gulf Producing								
1956	**5,657,708**	**1.46**	**6,808,713**	**32,046,073**	**6,450,000**	.....	**3,873,364**	**22,398,357**
1955	6,320,029	1.72	5,138,473	29,450,148	7,050,000	.....	3,670,191	17,337,769
1954	5,245,527	1.43	7,003,131	25,515,824	5,650,000	.....	1,222,297	13,632,794
Tidewater Oil Co.								
1956	**37,990,000**	**2.90**	**124,431,000**	**464,176,000**	**200,000,000**	**2,495,708**	**12,058,695**	**240,781,000**
1955	37,789,769	3.03	90,001,630	318,047,113	50,000,000	2,495,708	11,484,471	201,528,195
1954	34,547,239	3.13	94,502,763	229,957,767	.....	2,495,708	10,937,591	172,202,075
Union Oil Co. of California								
1956	**34,240,878**	**4.45**	**158,526,772**	**400,766,077**	**189,864,723**	.....	**7,700,433**	**198,494,743**
1955	30,522,963	3.93	88,304,805	379,741,538	135,782,286	.....	7,331,790	170,489,972
1954	35,887,920	4.78	80,250,321	358,836,922	93,996,735	232,500	6,658,864	173,419,329
Wilcox Oil Co.								
1956	**783,082**	**2.75**	**2,431,866**	**5,288,279**	.....	.....	**284,935**	**7,214,728**
1955	981,994	3.48	2,052,197	5,958,452	.....	.....	281,835	6,662,155
1954	647,516	2.30	1,938,948	5,582,685	200,000	.....	280,772	5,771,681

LATIN AMERICAN OIL COMPANIES

Creole Petroleum Corp.								
1956	**336,433,600**	**4.34**	**131,463,100**	**696,523,800**	.....	.....	**77,595,930**	**414,066,859**
1955	292,943,900	3.78	197,158,200	585,656,000	.....	.....	77,595,930	368,617,941
1954	239,865,310	3.09	216,630,200	573,867,000	.....	.....	25,865,310	439,131,763
International Pet. Co. Ltd.								
1956	**38,247,126**	**2.63**	**87,199,476**	**179,045,626**	.....	.....	**14,525,608**	**151,060,143**
1955	35,064,672	2.41	121,630,542	120,008,446	.....	.....	14,524,088	132,421,922
1954	25,481,441	1.75	102,919,962	117,895,309	.....	.....	14,524,088	114,786,155
Venezuelan Pet. Co.								
1956	**9,152,237**	**2.28**	**29,581,086**	**51,691,879**	**15,000,000**	.....	**4,000,000**	**60,314,350**
1955	5,038,613	1.25	23,468,686	48,330,314	15,000,000	.....	4,000,000	51,162,113
1954	3,621,338	.90	30,717,898	47,265,991	15,000,000	.....	4,000,000	46,123,500

EUROPEAN OIL COMPANIES

British Petroleum Co. Ltd.								
1956	**£ 53,014,561**	**£ 0-10-6**	**£ 43,990,585**	**£ 134,756,703**	[3] **£ 18,697,400**	**12,706,252**	**101,025,568**	**158,343,248**
1955	45,308,243	0- 9-0	61,859,526	124,935,305	19,072,900	12,706,252	100,688,000	116,698,094
1954	17,430,513	0- 3-6	15,809,916	132,558,187	20,000,000	12,706,252	100,687,500	114,583,913
Royal Dutch/Shell								
1956	**£ 179,528,055**	[2]	**515,700,658**	**592,685,018**	**169,429,637**	[2]	[2]	**1,029,219,977**
1955	159,992,265	[2]	525,946,670	820,767,880	170,556,112	[2]	[2]	890,824,447
1954	134,474,218	[2]	457,179,234	713,312,602	147,314,894	[2]	[2]	762,217,736

[1] Excludes plant and property of certain subsidiary companies.
[2] Ownership is 60% Royal Dutch Petroleum Co. and 40% The "Shell" Transport and Trading Co., Ltd.

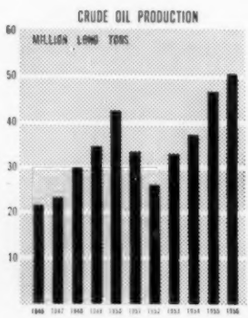
British Petroleum Company
Reports for 1956

British Petroleum's group sales of crude oil and refined products in 1956 rose to a new record of 53 million tons—an increase over 1955 of 11 per cent. After providing for taxation, depreciation and interest on debenture stock the consolidated net profit rose from £45 million to £53 million. But for the retarding effects in the last two months of the year of the closure of the Suez Canal, and of the damage to the Iraq Petroleum Company's pipeline system, BP's business would have expanded at a higher rate.

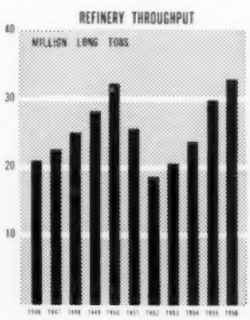
It is the intention, as stated at the last Annual General Meeting of the Company, to publish yearly and half-yearly group income statements; the first of these for the year 1956 appears below and shows the summarized trading figures of the Company and its Subsidiary Companies.

The initial half-yearly statement, for the first six months of 1957, will show comparative figures for the corresponding period of 1956, but it will be appreciated that the income in the current half year will be affected by the adverse conditions referred to above.

B. P. GROUP STATISTICS 1946-56



Crude oil production by BP last year was 1,017,000 barrels daily, or 82,000 more per day than in 1955. But for the curtailment of Middle East production in the last two months of the year, this increase would have been substantially greater.



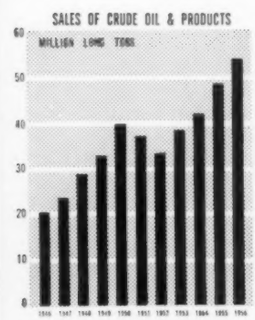
Refinery throughput at BP's 14 refineries during 1956 was 668,000 barrels daily, an increase of 62,000 barrels per day over 1955. Plans for new refineries in Canada and Germany have been announced.

THE BRITISH PETROLEUM COMPANY

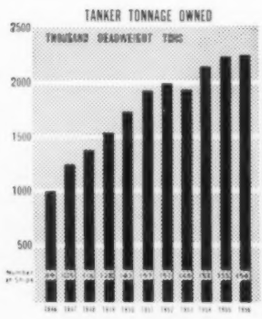
BRITANNIC HOUSE • FINSBURY CIRCUS • LONDON • E. C. 2

THE BRITISH PETROLEUM COMPANY LIMITED
GROUP INCOME STATEMENT
FOR THE YEAR ENDED 31st DECEMBER, 1956

		£
Sales Proceeds		721,633,000
Deduct: Sales Taxes, Customs and Excise Duties, etc.		174,333,000
Net Sales		547,300,000
Dividends and Other Income		10,327,000
		557,627,000
Cost of Oil, Operating, Selling and Administration Expenses	£381,480,000	
Depreciation and Amounts Written Off	37,288,000	
Interest Payable	2,578,000	
		421,346,000
		136,281,000
Taxation: United Kingdom and Overseas		79,631,000
		56,650,000
Deduct: Income applicable to Minority Shareholders		456,000
Net Income for the Year		£56,194,000
Attributable to: Consolidated Companies	52,718,000	
Non-Consolidated Companies	3,476,000	
		£56,194,000



Sales of crude oil and refined products in 1956 reached a record high of 1,089,000 barrels daily, an increase of 11% over 1955. This increase was almost equally divided between crude oil and refined products.



BP's tanker fleet consists of 154 ships totalling 2,258,000 deadweight tons. An additional 3,000,000 tons are on charter. Forty new tankers are due for completion during the next three years.

LIMITED

Copies of the Annual Report and Accounts may be obtained from the Purchasing Agent in U. S. A. for BP Trading Ltd., 610 Fifth Avenue, New York 20, N. Y.

Earnings of Canadian Companies Keep Pace with Expansion

Major integrated companies increased net earnings 15.8% in 1956 while trunk pipelines reported an astonishing rise of 73% as a result of traffic increases

MAJOR integrated companies in Canada enjoyed a profitable year in 1956. Their financial position continued to improve as it has in recent years.

The five majors in Canada which participate in all branches of the industry and which issue financial statements to the public increased their net income, working capital, capital assets and surplus during the year while making a substantial payment on long term debt. Capital expenditures for new plants and other facilities continued to rise. The five majors on which data is available are British American Oil Co. Ltd., Canadian Petroleum, Imperial Oil Ltd., McColl Frontenac and Royalite.

Net earnings of the five totaled $110 million in 1956 compared with $95 million in 1955, an increase of 15.8%. Payments of dividends to stockholders totaled $48.9 million, an increase of $8.6 million over the previous year. Earnings retained in the business totaled $147 million bringing surplus at the year end to $180 million.

The five companies reported total assets of $1,558 million on Dec. 31, 1956, an increase of $298 million over 1955. Funded and long term debt fill $15 million to $217 million. There was only a minor change in net working capital, the total for the five companies rising $12 million to $34 million.

All of the major companies in Canada have been expanding their facilities at a rapid pace in recent years in an effort to keep pace with the huge annual increases in domestic demand for oil products. In 1956 the five companies poured $180 million into capital projects compared with $133 million the previous year.

The two major crude oil pipeline trunk lines operating in Canada increased their net earnings 73% in 1956, to $16.7 million. Trans Mountain Oil Pipe Line Co. more than doubled its net profit as deliveries to U.S. refineries continued to rise. Per share earnings were $4.65 in 1956 and $2.05 in 1955. Interprovincial Pipe Line Co. profits rose 50% as a result of a 20% increase in oil deliveries from $1.30 in 1955 to $1.92 last year.

Trans Mountain traffic was cut sharply in the second quarter because of a refinery strike in Washington but resumed its upward rise after midyear. Record for the year by quarters follows:

	Barrels Daily
First Quarter	122,959
Second Quarter	95,744
Third Quarter	142,461
Fourth Quarter	154,818

U.S. refineries in Washington took 40.7% of the crude in 1956, British Columbia plants 46.1% and 13.2% was loaded into tankers. System capacity was raised from 120,000 to 185,000 b/d in 1956 and will increase to 240,000 b/d by the end of 1957.

Interprovincial also substantially increased its deliveries to U.S. refineries in 1956, from 5.3 million to 16.9 million barrels. Eastern Canadian refineries took 40.5 million barrels compared with 33.9 million in 1955. To take care of the larger demand in the east Interprovincial completed a looping program spending $9.5 million and bringing net fixed assets to $200 million. This year the company is extending its line from Sarnia to Toronto at a cost of $26 million.

IMPERIAL OIL LTD.: Record outlays of $160 million this year for exploration and capital facilities are forecast in Imperial Oil's annual report for 1956. Net earnings last year, after provision for income tax, were $69,098,692, 11.2% more than in 1955, and the highest in the company's history, even though 1955 was a record year in itself.

Increases directly reflect high expenditures for exploration and for plants and equipment. These amounted to $134 million in 1956. Up to the end of 1956, Imperial's expenditures for exploration and capital facilities since it discovered the Leduc field 10 years ago have exceeded $800 million. The company's investment per employee has increased to $46,000 from $14,800 during the same period. Refinery throughput and sale of petroleum products each topped the 100-million-barrel mark for the first time in 1956, and new records were set in all other major phases of the business. Gross income for 1956 was $837 million, compared with $700 million for 1955—an increase of 19.6%.

1956 earnings of $69,098,692 were equivalent to $2.20 per share, compared with $2.08 per share in 1955.

Product sales averaging 275.000 b/d were 10.2% higher than the 1955 record of 250,000 b/d. Largest increases were in heating oils.

Imperial's gross production of crude oil, at 44 million barrels, was up more than 10% over 1955. Exploratory drilling included 117 net wells in western Canada, 46 relatively shallow holes in Ontario, and one hole in the St. Lawrence lowlands of Quebec. These resulted in 22 new discoveries in western Canada (13 oil and 9 gas), and in the finding of two new Ontario gas fields. In addition, 238 successful development wells (including five gas wells) were completed in the prairies and Ontario.

The company's nine refineries stepped up their output 15.4% by processing more than 100 million barrels of crude oil, 64% of it from Canadian wells. A $30 million expansion and modernization of the company's Halifax refinery was largely completed, and a $4½ million wax plant at Sarnia reached the final construction stage.

The company's pipelines and those in which it has investment interests handled greater volumes, and tank-car requirements reached a new peak in October of some 7,000 cars. The company owned and operated 13 lake and coastal vessels and two ocean vessels. "Imperial St. Lawrence," a 35,550 dwt. tanker, was launched at Nagasaki, Japan, on December 4 for a wholly-owned subsidiary. An order was placed with a Collingswood shipyard for a 6,150 dwt. tanker for lake and coastal service.

British American Oil Co.: British American Oil Co. celebrated its 50th anniversary in 1956 by chalking up gains in all departments of its business. Net profits were up 21.9%, to $25 million. Production and refining activities reached a new high, as did product sales.

On July 1, the company expanded its producing activities sharply through the purchase of western Canada properties of Canadian Gulf Oil Co.—by the sale of stock to Gulf Oil Corp. The purchase makes B-A one of the largest producers in the country. It has been a leading refiner and marketer for many years.

Crude production in western Canada by B-A totaled 6.9 million barrels in 1956, compared with 1.4 million in 1955 and 1.1

million in 1954. Reserves of crude and natural-gas liquids in Canada at the end of 1956 totaled 340.2 million barrels, while natural-gas reserves totaled 3.3 trillion cubic feet. The company produced 9.4 million barrels of oil in the United States, an increase of 300,000 barrels over 1955. USA reserves were up to 89.7 million barrels of liquid products and 364 billion feet of gas.

B-A refineries processed 34.5 million barrels of crude, and other plants ran 3.3 million barrels for the company's account. Increase in processed crude was two million barrels over 1955.

The company made very large capital investments in 1956 in expansion of its marketing, refining, and producing activities. Total new investment was $62.3 million, in addition to the new investment of $62.4 million in Canadian Gulf properties. Net assets at the end of the year totaled $379.2 million, compared with $263.3 a year earlier. Current assets totaled $112.9 million, and properties and equipment $242.9 million after deduction of $148.8 million in accumulated depreciation, depletion, and amortization. Bookkeeping methods were changed during the year to a more conservative basis with respect to dry holes and exploration expense.

B-A gross income in 1956 rose nearly $10 million, to $279.2 million. Expenses were up about $11 million. Income taxes were reduced about $5 million as a result of the Canadian Gulf purchase. Because of this tax saving, net profit of the company rose $4.5 million, to $25.1 million. Of this, $9.4 million was paid to stockholders in dividends at the rate of $1.00 per share. In 1956 dividends were $0.85 per share.

B-A's nonproducing acreage in western Canada was approximately 11.3 millions of acres at the end of 1956, an increase of approximately 10% over 1955; and exploration activities showed a marked increase in all phases, particularly wildcat drilling. B-A drilled 73 gross wildcat wells in 1956, an increase of 66% over the combined Canadian Gulf and British American program of 1955. The company's success ratio in 1956 was one in three.

The most important gas discovery was made on the Dick Lake unit in central Alberta, where B-A is operator with a 46% in the 6,240-acre unit. B-A holds adjacent 100% acreage to this unit. Very substantial reserves of natural gas and natural-gas liquids were discovered as a result of the two wells drilled in this area.

In southeastern Saskatchewan, B-A found oil in three of its wildcat ventures, and at the end of the year was evaluating oil shows in five other wildcats. In Alberta, B-A's extensive land holdings were improved in value as a result of nine wildcat successes in central Alberta which included four oil wells, one condensate well, and four gas wells. In addition, British American had four gas discoveries in the Peace River area of Alberta and one gas discovery in the Foothills area of Alberta. The four companies comprising the Northern Foothills Agreement, which operates in northeastern British Columbia, found gas at three of their ventures in 1956.

Production drilling operations in 1956 were, to a considerable extent, concentrated in Saskatchewan. Of the 152 development wells in which the consolidated company participated—an increase of 32% over the combined Canadian Gulf and B-A development well program in 1955—99 were completed in the Steelman, Kingsford, Lampman, and Midale fields of Saskatchewan.

In Alberta, the company completed 47 development wells, of which 22 were drilled in the Pembina field; 24 in the older fields, including Fenn-Big Valley, Stettler, and Erskine; and one, a gas and condensate well, in the Pincher Creek field. In Manitoba, two wells were completed in the Virden field, and four partnership wells were completed in northeastern British Columbia. All wells completed, with the exception of those in British Columbia, were company-operated. Of the total 1956 development program, B-A's net-interest wells totaled 105—an increase of 25% over the Canadian Gulf-B-A combined program for 1955.

As a result of the increased development drilling operations last year, at December 31 B-A owned or had an interest in 912 wells capable of production, an increase of 22% over the combined Canadian Gulf and B-A total at the end of 1955. The company's net crude-oil production increased from a combined average of 28,330 b/d in 1955 to a daily average of 32,040 bbl in 1956—an increase of approximately 13%. At the end of 1956, net crude-oil production was approximately 38,000 b/d.

During 1956, considerable progress was made toward the unitization of the Stettler D-2 pool, in which B-A holds an approximate 79% interest. Studies completed in 1954 showed that pressure maintenance by water injection would be necessary properly to deplete the pool, and that a considerable increase in recoverable oil would result thereby. Because pool operations with pressure maintenance could be carried out more efficiently and economically through unit operations, unitization negotiations were begun in 1954. By the end of 1956, negotiations were almost complete, and unit operations are expected to begin in the immediate future. The Stettler D-2 pool will be the first major pool in the province in which a diversified ownership of the working and royalty interest has been unitized after development.

Nevis Gas Conservation Project: B-A's Nevis Gas Conservation Project utilizes the

MAJOR INTEGRATED COMPANIES

	Net Income	Per Share of Common	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
British American Oil Co.								
1956	$25,134,091	1.36	55,992,591	242,875,073	30,729,717	———	18,432,498	130,333,283
1955	20,613,219	2.27	60,636,633	155,701,327	41,583,780	———	9,099,999	110,047,815
Canadian Petrofina Ltd.								
1956	1,897,123	—	5,572,260	103,632,120	30,928,500	5,282,922	20,000,000	20,796,870
1955	1,026,289	—	13,618,433	98,652,790	40,493,000	4,856,824	20,000,000	15,220,425
Imperial Oil Ltd.								
1956	69,098,692	2.20	254,490,598	429,525,403	94,170,388	———	31,429,887	267,986,536
1955	62,145,140	2.08	207,612,418	372,519,508	96,628,338	———	29,865,691	235,307,515
McColl-Frontenac Oil Co. Ltd.								
1956	12,765,028	4.81	35,519,709	67,132,550	31,019,278	40,000	3,174,769	43,611,556
1955	10,283,094	3.85	26,952,791	47,292,239	21,665,000	60,000	2,607,963	35,760,861
Royalite Oil Co.								
1956	1,060,835	0.27	5,670,478	36,523,559	29,760,000	167,473	2,945,502	5,682,819
1955	1,043,437	0.27	9,057,623	34,536,381	31,558,318	200,000	2,880,448	5,629,144

MAJOR CRUDE LINES

Interprovincial Pipe Line Co.								
1956	9,720,247	1.92	15,779,892	207,683,642	149,153,530	———	5,050,343	38,739,487
1955	6,531,027	1.30	14,295,847	206,786,183	154,281,362	———	5,039,832	34,341,022
Trans Mountain Oil Pipe Line Co.								
1956	6,991,424	4.65	726,953	94,104,354	68,918,637	———	1,504,928	6,782,390
1955	3,086,172	2.05	(323,785)	92,875,266	75,091,447	———	1,500,028	1,295,894

Fenn-Big Valley and Stettler oil fields' solution gas. (The gas was flared until December 1956.)

The overall project consists of three plants; a compression refrigeration plant was built at Fenn to process the solution gas from the Fenn-Big Valley field, by removal of propane and heavier ends in liquid form. The liquid hydrocarbon product recovered is piped under high pressure to the Stettler area, where a similar plant recovers the propane and heavier ends from the Stettler field solution gas. The combined liquid stream is then piped to Nevis, where a fractionation plant produces propane, butane, and natural gasoline from the raw product.

The residue gas from which the liquids have been removed, available from the Fenn and Stettler plants, is transported by a separate pipeline to a gas-treating plant at the Nevis fractionation-plant site, where it is treated and conditioned prior to delivery to Canadian Western Natural Gas Co. for public consumption.

The volume of oil gathered and transported in 1956 by the company's three wholly owned pipeline systems, Britamoil Pipe Line, B-A Alberta Pipe Line, and B-A Saskatchewan Pipe Line, increased 21% over the previous year; and construction activity centered about the largest of the systems, The Britamoil Pipe Line Co.

A 17-mile gathering system in the Driedmeat Lake area was constructed and put into operation. The system gathers crude oil in the North and South Battle fields and the south part of the Joarcam field and delivers it to the company's trunk line at the Duhamel receiving station for transportation to Edmonton.

In October 1956, a 35-mile 10¾-in.-diameter extension was built from the previous Big Valley terminal to the West Drumheller field, and put into operation. This extension brought an additional daily average delivery of 4,000 bbl to Edmonton.

Canadian Petrofina Ltd.: Toward the end of 1956 Canadian Petrofina Ltd. concentrated less on construction of service stations and more on consolidation; less time, that is, than during the hectic first three years of its existence when some 1,200 stations sprounted up throughout the Maritimes, Quebec, and Ontario.

June 26, 1956, saw the official opening ceremonies of the 20,000 b/d $30,000,000 refinery, actually onstream since the previous autumn, but company officials waited until spring, when the final landscaping was finished to officially push the opening button. Appointment of Alfredo Campo as president of the company was announced on this occasion. Campo was formerly executive vice president.

An alkylation unit, the first constructed in Canada solely for automotive fuels, has come in for a great deal of attention and publicity. For the past year Petrofina has been producing and marketing a premium gasoline called Super-Fina Alkyl-Gas, with one of the basic ingredients being alkylate produced from this unit. This, say company officials, is one big reason its premium gasoline is the top octane motor fuel in the country, and they are drawing further attention to it this year by dispensing it from golden pumps. While growth has been leveled off to a normal pace, officials state that the company's period of consolidation has resulted in an overall increase of gallonage and business has never been better.

A new system of training stations and training conferences has been inaugurated to insure that Fina dealers will always be fully informed on the latest developments in merchandising and products.

Further expansion is definitely planned and the organization has stressed that consolidation does not mean a rest period They are merely adding more substance to the huge framework which shot up over night.

McColl-Frontenac Oil Co. Ltd.: The company's net earnings were up to $12,765,028 in 1956, a rise from about $10.2 million in 1955. Cash dividends per common share were $1.35 in 1956, compared with $1.20 in 1955. On Dec. 4, 1956 a quarterly dividend of 40¢ was declared payable to stockholders on record of Dec. 28, 1956.

Net crude oil production increased 29% over 1955, to 2,208,734 barrels. During the year, the company acquired 238,000 acres, including 1,120 acres in the Pembina field. An interest in another Crown reservation also was acquired under a farmout agreement.

Ten wells were completed on the Company's wholly-owned property in Pembina and all were successful. The company also participated with others in the drilling of a number of wells. At the year end, the Company had royalty interests in 161.25 wells, and working interests in 53.97 net wells.

Regent holds interests in approximately 1,250,000 gross acres. At the end of 1956, Regent's net crude oil production averaged 87 b/d. Net crude oil production in Trinidad totaled 2,190,557 barrels, an increase of 87% over 1955.

The company's estimated net reserves of crude oil and natural gas liquids in Canada and Trinidad were approximately 70 million barrels at the year end.

The company's refineries at Montreal and Edmonton processed 23,073,724 barrels of crude oil, compared with 18,581,803 barrels in 1955. The construction of a 10,000 barrel-per-day catalytic desulfurization unit was started at the Montreal refinery.

The capacity of the Portland-Montreal crude oil pipe line, 18% owned, was increased from 210,000 to 237,000 b/d. Trans Northern Pipe Line Company, 33.33% owned, increased the capacity of its products pipe line, which extends from Montreal to Toronto, Hamilton, and Ottawa, from 50,000 to 65,000 barrels per day.

Sales of petroleum products reached a new peak of 21,933,527 barrels, an increase of 28% over 1955. This does not include sales by Regent.

The year 1956 saw Canada's gross national product approach $30 billion, an increase of 11% over 1955. While there may be a slowing down in the rate of increase in 1957, the country's economy will undoubtedly continue to expand and, as heretofore, the oil industry will be among the leading participants in its growth.

Merrill Petroleum Ltd.: Merrill Petroleums Ltd. disclosed a profit of $2,645,271 in 1956, equivalent to 91 cents per share and slightly more than three times the 1955 earnings per share of 30 cents. The profit before provisions for depletion, depreciation and abandoned leases was $4,593,657, an increase of $2,970,747 over the previous year. Total net production for 1956 amounted to 2,227,705 barrels, as compared to 715,206 barrels for 1955. Average daily production during the year was 6,087 barrels.

Merrill participated in the drilling of 264 development oil wells, 249 in the Pembina oil field. Additionally 160 producing wells were completed in the Pembina area on acreage in which a gross overriding royalty interest is held. The company had, at the year-end, a working interest in 716 producing oil wells and a royalty interest in 379 producing oil wells.

Contract drilling operations revenue amounted to $5,039,999 as compared with $3,702,402 in 1955. Four rigs were acquired during the year increasing to fifteen the total number of rigs now operating.

The company participated in 14 exploratory tests during the year, resulting in three capped gas wells, one oil well and the balance dry holes. The net exploratory acreage holdings were increased to 1,498,577 acres from 462,488 acres, continuing the aggressive but selective land acquisition policy. During 1957 the company expects to participate in the drilling of 105 development oil wells and anticipates an increase in crude oil revenue of approximately 25%.

Of the total of 78,000 Pembina acres in which the company has an interest, 4,000 have been subjected to a pressure maintenance scheme which has recently been installed. Engineering studies indicate a large increase in recoverable oil is possible due to this program.

California Standard (Canada): Activity of Standard Oil Co. of California's Canadian affiliate emphasized evaluation of holdings previously acquired and expansion of productive capacity. The company's crude oil and natural gas liquids production rose from 17,936 b/d to 23,552 b/d during the year. Net production in 1956 was 20,593 b/d.

Bailey Selburn Oil and Gas Ltd.: This growing company had an operating profit of $2,475,000 in 1956, a 51% increase in one year.

Proven oil reserves have been increased 46% to 25 million barrels, with an additional eight million barrels in the development stage. Gas reserve acreage has been increased from 1,482,000 acres from 946,000.

A highlight of the company's gas program in 1956 was signing of a contract with Trans-Canada Pipe Lines Limited to deliver considerable amounts of gas from the Bindloss, Alberta, field. END

Picture courtesy Automobile Club of Buffalo, New York

The race was won, an era begun...

To the curious crowd, it was Thanksgiving Day, 1895. To the Duryea brothers, it was D-Day.

For this was the day they would compete in America's first automobile race, from Chicago to Evanston and back. A race that would see only six of over 80 entries able to start . . . and only two able to finish.

At 7½ miles per hour, the Duryeas' car didn't exactly sweep across the finish line as it won . . . but it did sweep away the last obstacles to the automotive era.

Nor was it merely the automobile age which the Duryeas ushered in. For, as thousands and then millions of automobiles took to the road, petroleum fell heir to the job of powering them. Oil became our greatest source of energy.

So it is that Cities Service, which has grown up with the automobile, now is faced with the biggest demand for its products in history . . . a demand heightened by the development of entirely new gasolenes now at Cities Service stations.

These new gasolenes are years ahead of their time . . . fitting companions for the cars of the future which automotive men have brought us today. More importantly, they're typical of all Cities Service products, and symbolic of even finer petroleum products to come.

CITIES SERVICE

The Test Site Looking South.

LPG and Ammonia Cars to Shed their Overcoats

By Paul W. Tucker*, D. S. Baird*, F. J. Heller*, and J. E. Donnelly*

Uninsulated, single-unit, high-pressure tank cars for the transportation of LPG and anhydrous ammonia will be built and in service during 1957. This is the story behind this significant development.

HISTORICALLY, all of the single-unit tank cars for the transportation of liquefied compressed gases have been insulated. The first multi-unit LPG tank car was uninsulated just as are all of the multi-unit tank cars of today. However, for reasons known principally to but few "old timers," single-unit tank cars for LPG, anhydrous ammonia, and the other liquefied compressed gases were required to have an insulating blanket (originally 4 in. of cork and later, an alternate, 4 in. of fiber glass was accepted) completely encircling the tank with a metal jacket on top of that. It must be said, however, that these tank cars (probably 23,000 in LPG service) have been a good transport container with nothing short of a phenomenally good safety record. These so-called "high-pressure" cars (the ICC-104A and ICC-105A series) have been in wrecks, rolled down embankments, and have been punctured. The record of tank-car transportation of "hazardous" commodities—which includes LPG and anhydrous ammonia—is published annually by the Bureau of Explosives, and this record is certainly a testimony to the adequacy of these "containers."

However, transportation costs, like others, have continued to spiral upward. In fact, for much of the LPGas sold, the transportation costs exceed the cost of the product at its source. Capital investment in new tank cars continues to increase with higher steel and labor costs. In an effort to halt, or at least to slow, the increase in the cost of the transportation "package," the authors reviewed tank-car design and asked, among other things, "why is tank-car insulation necessary." This becomes a most pertinent question when it is realized that untold thousands of trucks and literally millions of storage containers for both LPG and anhydrous ammonia do not have insulation on them—and they never did. Doubtless others have asked the same question, but were deterred by the rather formidable task of getting such a change accepted.

Although there are several tank-car committees in different industry trade groups, one of the most prominent—particularly as it relates to the tank-car tank—is the Tank Car Committee of the Association of American Railroads (AAR). Representation on this committee comes from the railroads as well as from the petroleum (American Petroleum Institute), chemical (Manufacturing Chemists' Association), chlorine (Chlorine Institute), and the compressed gas (Compressed Gas Association) industries. It is easier, in retrospect, to understand the very conservative approach to new ideas and developments. However, as technology and engineering have advanced in recent years, procedural requirements have been streamlined. And today, with the help of industry and its trade groups, along with the tank-car builders, a healthy climate exists for recognizing and utilizing new ideas. This will doubtless lend itself to a further streamlining and encourage even more and

* *Phillips Petroleum Co., Bartlesville, Okla.*

greater developments in tank-car construction and transportation.

Though the authors were convinced that uninsulated tank cars would be safe and completely adequate as a transportation container, they felt it would be necessary to prove by actual test that they were right. Consequently, they decided to determine experimentally the effect of maximum summer heat on the tank-car pressure when the insulation and jacket are removed from the tank car. To do this, they ran full-scale tests using two tank cars: one, a conventional ICC-105A300W (11,070-gal water capacity); the second, an uninsulated ICC-105A400-M (10,518-gal water capacity). After a review of climatological data, it was decided to run the tests on a spur track at Borger, Texas. This decision was based not only upon favorable (high temperature conditions, but on the sun radiation intensity and the high percentage of clear days. The site was also chosen so that the tank cars would be oriented in a north-south direction. Such orientation was important because it presented the greatest tank surface area to the sun during the daylight hours. Hence, it represented the most severe test condition. A general view, looking south of the test setup, is shown in the photograph herein.

The test was carefully and completely instrumented. An "instrument adapter" was placed on the test car. It was placed in the usual location of the safety valve; and the safety valve, in turn, was mounted on the instrument adapter. An automatic device for determining the liquid level was mounted in top of the adapter and spaced down through the tank at 1-ft intervals from the bottom to measure temperature. The safety relief valve was set higher than the maximum expected pressure so that continuous pressures would be recorded.

After the test tank car had been outfitted, it was moved to the test site and filled with anhydrous ammonia to a density of 55.3%. The insulated control tank car was filled to the usual filling density (57%) with ammonia from the same source. Additional thermocouples were installed to measure temperatures in the control tank. Pressure leads or connections were installed on both cars.

Ambient temperatures were measured on the north (shaded) side of the instrument house. Sun radiation intensity was measured by a pyrheliometer. This instrument generates a voltage proportional to the intensity of sun radiation striking a horizontal plane. All instruments were connected to indicator-recorders in the instrument house, and data recorded 24 hours a day. All reflectivity measurements were taken by a Photovolt reflectance meter with a green tri-stimulus filter.

In addition, precipitation was measured daily at the test site. Wind direction, velocity, and other weather information was obtained from the airline office at the Borger Airport.

Anhydrous ammonia was chosen as the test media because, at the temperatures which had been expected during the test, anhydrous ammonia would exhibit higher pressures than commercial propane.

Data were collected when the test car was painted successively white, then gray, and then black. Each series of tests using the different colors on the test car was continued until the maximum conditions plateaued—indicating equilibrium conditions.

Fig. 1 shows the relationship which existed between maximum ambient temperatures and maximum pressures in the test car. The temperature-pressure data were conservatively extrapolated to obtain pressures to be expected up to 130 F ambient temperature.

Fig. 2 is a plot showing the relationship of the paint reflectivity to the maximum tank-car pressure for three maximum ambient temperatures. These curves were produced by taking the tank pressure from Fig. 1 at the desired ambient temperatures and plotting them against the known reflectivities of the paint. These curves permit one to assume a desired maximum tank pressure and, knowing the maximum ambient temperature to be encountered, predict the paint reflectivity required to keep the tank pressures below the desired maximum. For example, if it were required to keep a tank pressure below 300 psig at a maximum ambient temperature of 115 F, the minimum reflectivity would be 13%.

Also shown in Fig. 2 are the corrected tank pressures vs. reflectivity. These are the values which would be obtained if there were no air in the vapor space. Actual analysis of the vapor space showed that it

Fig. 1. Pressure Vs. Ambient Temperature When Test Car Has Been Painted Various Colors.

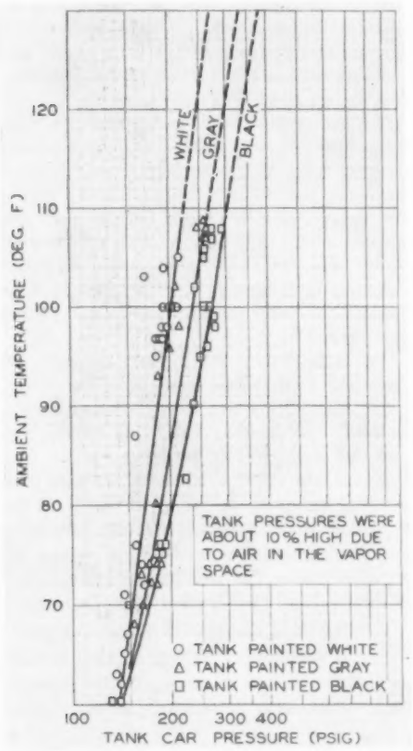
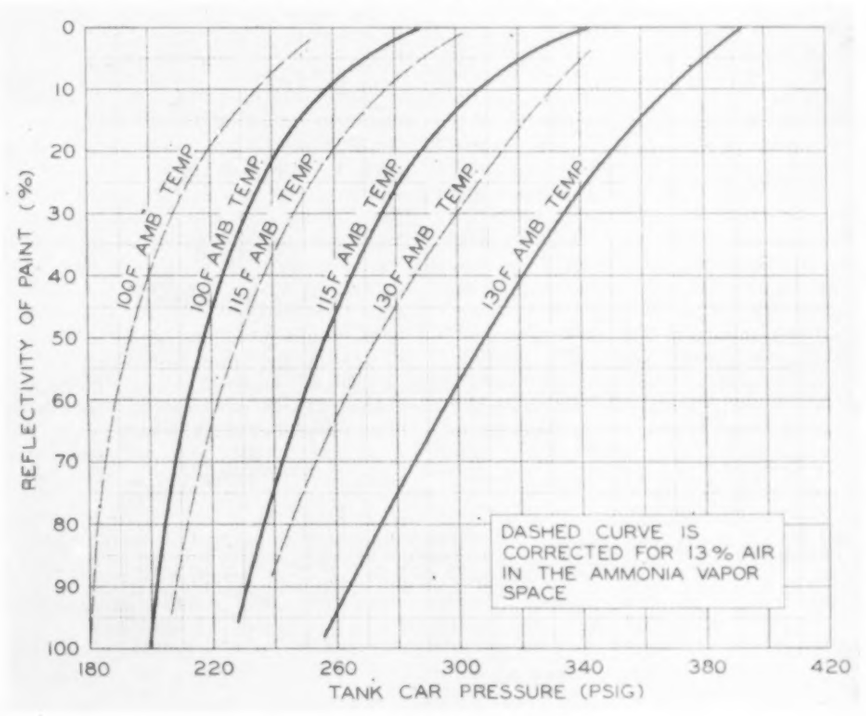


Fig. 2. Tank-Car Pressure Vs. Reflectivity of the Paint.



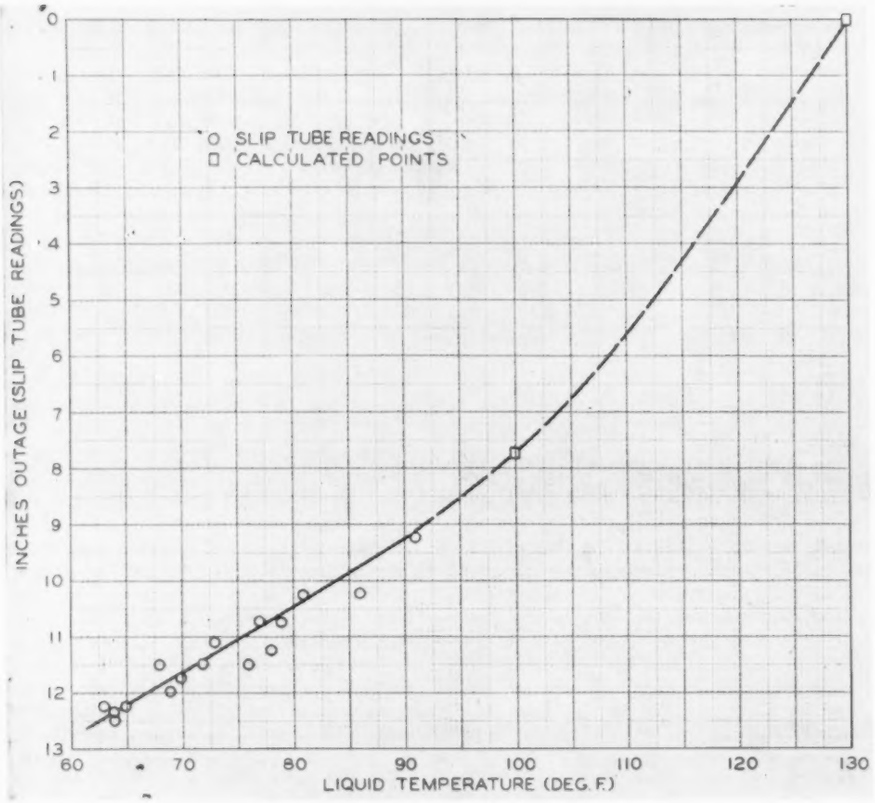


Fig. 3. Liquid Temperature Vs. Liquid Level.

contained 13% air. This would cause an approximate 10% increase in pressure in the range encountered in the tests. Actually, the presence of the air tended to make the test conditions more severe than actual conditions.

Fig. 3 shows the relationship between liquid temperature and liquid level. This curve is based on slip-tube readings, and merely serves to confirm the calculated filling density. Slip-tube gage readings were used instead of the automatic level indicator because it was found that the latter instrument was somewhat affected by the sun.

Ideally, the pressure of a confined gas depends primarily on the temperature. In the case of a closed vessel such as a tank car, the temperature is largely dependent upon the absorption of radiant energy from the sun. Therefore, anything which would limit this absorption would be capable of limiting the pressure. Some might question the ability of a light-colored paint to retain enough reflectivity to accomplish this purpose. However, white storage tanks have been in operation in the Borger, Texas, area for many years, and this area has two active carbon-black plants. A few years ago several channel-black plants were also in operation in the area. Excellent opportunity has been available for these tanks to darken, but they have not. Furthermore, Fig. 2 shows that, for a maximum pressure of 300 psig to be reached even in 115 F weather, the reflectivity would have to drop to 13%. This combination represents an almost impossible set of conditions. Therefore, it is believed that any light reflective paint would be capable of permanently reducing the amount of sun radiation absorbed by pressure tank cars.

It was also noted, as one might readily expect, that showers caused an abrupt cooling and a drastic lowering of pressure in the uninsulated vessel. Cloudy days produced a somewhat smaller pressure buildup than clear days, even though the ambient temperatures were comparable. Although no attempts were made to confirm the effect of wind, it is known that wind aids the dissipation of heat from tanks and thus retards the pressure buildup. This would mean that a stationary tank car would represent a more severe condition than a moving tank car. Showers, cloudy days, and wind all affected the data, and were reflected as a scattering of points on the pressure vs. ambient temperature curves as shown in Fig. 1; and, when the curves were extrapolated, it was assumed that the atmospheric conditions encountered in the tests were typical. It is believed that the hot, dry climate of the Borger area made this a safe assumption. In fact, these data have since been subjected to mathematical analysis and reduced to equations whose correlations are of a high order; hence, further substantiating our position.

An extension of the data curves is indicated in Table I.

Based on these facts, it was concluded that uninsulated tank cars with relief-valve setting of 300 psig could be painted any light color and be safely operated in LPGas and anhydrous-ammonia service.

Having completed the tests, reviewed the data, reached their conclusions, and prepared a report, the authors felt they were ready to present the matter to industry at large. The report was presented to the Tank Car Committees of the Manufacturing Chemists' Association, Compressed Gas Association, and the American Petroleum Institute (Railway Equipment Committee of the Central Committee on Railway Transportation). The recommendations were endorsed by all of these trade-association committees. It was also presented to the Natural Gasoline Association of America (NGAA) because that association represents practically all the LPG producers and shippers. The report and its recommendations were also discussed with the Chlorine Institute, the Bureau of Explosives, and the ICC. The authors completed their presentation to industry by discussing it with several of the major railroads. Subsequent to this, and with unanimous industry support, uninsulated pressure tank cars were approved by the AAR Tank Car Committee during its December 1956 meeting.

At the present time the AAR Tank Car Committee, Subcommittee on Specifications, is preparing a specification for this new tank car. It will be known as ICC-112A400-W. This car will be used in both anhydrous-ammonia and LPG service, and will have its relief valve set at 300 psig with a relieving capacity as required by the revised Appendix "A" which is about to be completed by the AAR.

In anticipation that other shippers of liquefied compressed gases will be interested in utilizing this new tank-car development, specifications are being written for 200, 300, and 500 psig series as well.

There are other changes which can, and should, be made in tank-car design if its utility is to be maintained, and if it is to remain competitive with other forms of transportation. The development herein reported is one such change. Industry, along with the tank-car builders and the railroads, should cooperate to the fullest to take advantage of new ideas, materials, design, and "know-how" to facilitate further progress. END

TABLE I

Color	*Paint Reflectivity* (%)	*Maximum Pressure at 115 F Ambient Temperature* (PSIG)	*Maximum Pressure at 130 F Ambient Temperature* (PSIG)
White	84	235	270
Gray	27	280	340
Black	5	320	380

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As it comes from the ground, oil is almost useless. But, stored, moved, created into new products—oil becomes energy, color, lubrication, medicine.

General American works with petroleum companies to bring oil in its various forms to you. General American engineers design new kinds of tank cars for corrosion-free shipment. Research men find new ways to store oil and reduce vapor losses . . . saving precious volatile liquids. Development men build terminals to meet the expanding public demands. While technical experts engineer processing equipment that anticipates tomorrow's needs.

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THE STEEL TUBE AGE

S & L steel tubes have for many years been extensively used in drilling for oil, gas and water all over the world.

They have recently played their part in a large scale search for natural gas in this country where exploratory work is being conducted by the BP Exploration Company Limited on behalf of the Gas Council.

The principal reasons for the search are the increasing cost and scarcity of coal suitable for the nation's gas industry.

The illustration is of S & L $8\frac{5}{8}$ in. A.P.I. casing being strung at one of the exploratory sites, at which a well was sunk to a depth of approximately 7,000 ft.

STEWARTS AND LLOYDS LIMITED

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The largest manufacturers S&L *of steel tubes in Europe*

$50 MILLION ATHABASCA DEVELOPMENT

Athabasca oil sands: Part of the oil-sands pit, exposed near the pilot plant at Bitumount, Alberta. Property in Bitumount area covers 6,900 acres. (Royalite photo.)

Ray Althouse, president, Royalite Oil Co. Ltd.

G. R. Coulson, inventor of the centrifuge process for the separation of oil from the Athabasca sands.

A $50 million program in the Athabasca oil sands of northern Alberta has been announced after two years' intensive study jointly by Royalite Oil Co. Ltd. and Can-Amera Oil Sands Development Co., Calgary, in a search for an economical method of separating the oil from the sands. Seeking to perfect the Coulson centrifuge process, development and research have been conducted by Royalite engineers at the oil-sands pilot plant at Bitumount, 60 miles north of Fort McMurray, purchased in 1954 from the Alberta government.

According to President Ray Althouse, Royalite's initial plans call for the construction of a separation plant and a 20,000 b/d process plant on the company's 50,000-acre lease at Mildred Lake, halfway between Bitumount and Fort McMurray. The company's property is estimated to contain a potential one billion barrels of oil; and, on the basis of a 20,000 b/d plant, the Royalite acreage alone should last 100 years.

Preliminary construction was to begin this spring by Caribou Engineering Co., Calgary; by the summer of 1958 some 1,000 should be employed; and heavy construction is planned for 1959 with the building of the plant and a 350-mile pipeline to Edmonton. Entire project is estimated to be ready for operation by 1960. A minimum of $50 million will be required.

The huge reserves of oil in the bituminous sands have been known to exist since the earliest explorers traveled through this part of the country. Reserves have been variously estimated at between 100 billion and 300 billion barrels of oil. Many attempts and millions of dollars have gone toward attempts to make these sands give up their oil.

All of the methods tried to date were one type or another of cold- or hot-water washing. The Coulson centrifuge process—invented by Gordon Coulson of Calgary, and perfected by Royalite associates—spins the sand from the oil. The sands are mined and then sent to a river-front plant, where banks of giant centrifuges (some 50 in all) automatically separate the oil, sand, and minute clay particles. "Spoil" pits take clean waste sand; and the 7-gravity oil is cooked and sent to a plant for recovery of some 140 tons of sulfur per day. The resulting 20- to 30-gravity crude will stand normal pipeline flow, and the petroleum coke is used as plant fuel.

It is planned to sell the crude to refineries at Edmonton at a premium price per barrel over natural crude from drilled oil wells because of its yield of more high-value products, ranging from premium gasoline to jet and diesel fuel. It is claimed there will be no waste.

Royalite is a fully integrated oil company —engaged in exploration, production, manufacturing, and marketing. Its own growing retail network of 450 outlets in western Canada is expected to absorb, in initial stages, the entire crude production from the Mildred Lake plant. END

review of

RECENT U.S. PATENTS ON DESULFURIZATION

by Heinz Heinemann and Harold Shalit

DESULFURIZATION patents were last reviewed in the 1956 Annual Refining Issue of World Petroleum, but the field has been so active that a new review prior to July appeared desirable. While hydrodesulfurization patents were predominant for several years, interest in sweetening, extraction, sodium refining, etc. seems to have increased recently and less than half of the about 50 patents reviewed here deal with hydrogenative methods.

Hydrodesulfurization

A group of new British Petroleum Co. patents describes features of the Autofining process. F. W. B. Porter in 2,749,283 applies the process to cracked naphthas. The cracked naphtha is mixed with straight run naphtha of the same boiling range in such a proportion that on passing the mixture over a cobalt-molybdena-alumina catalyst enough hydrogen is obtained by naphthene dehydrogenation to convert organic combined sulfur to hydrogen sulfide and to maintain a hydrogen circulation, sufficient to keep the mixture in vapor phase. In 2,749,282, and 2,749,283 F. W. B. Porter and A. H. Richardson describe treating cracked naphtha in the gasoline boiling range in admixture with a petroleum fraction containing sufficient naphthenic constituents and having a boiling range such, that the naphtha may be removed by distillation from the treated mixture. Porter and J. W. Hyde are the inventors of 2,771,400, according to which sulfur compounds and particularly thiophene are removed from benzol by autofining benzol and naphthene rich naphtha over cobalt-molybdena-alumina at 750-800° and 100 psig. A hydrodesulfurization catalyst is disclosed in 2,769,755 and 2,769,756 (F. W. B. Porter and J. N. Haresnape and J. S. Isitt). This consists of mixtures of oxides of cobalt and molybdenum in amounts of 15% MoO_3 and 0.2-3% Co dispersed on a trihydrate bauxite, which has been treated for at least 2 hours at a temperature of about 550°C and thereafter has a surface area greater than 120 m^2/g.

K. Nozaki in two Shell Dev. Co. patents describes an active hydrogenation catalyst for aromatics and sulfur compounds. According to 2,744,052 this consists of more than 8% of a mixture of tungsten, molybdenum and nickel on alumina. The mole ratio of nickel to molybdenum is between ¼ and ⅔ to 1, of tungsten to molybdenum between ¼ and 1 to 1. The catalyst after impregnation of the components on alumina is calcined to convert the metal compounds to oxides and is then sulfided at 110-215°C for at least ½ hour with a mixture of hydrogen and H_2S is a mole ratio of between 1:1 and 40:1. According to 2,758,957 a nickel-molybdenum catalyst is used, having a nickel to molybdenum ratio of between ¼ and ⅔ to 1 and a total metals content of about 5%. Desulfurization with a nickel peroxide catalyst is the subject of E. D. Sowerwine's patents 2,776,244 and 2,776,245 (to Wigton-Abbott Corp.). The catalyst has the formula NiO_X, where x is a value in the range 1.8 to 2.2.

R. A. Hanson (2,746,907 to Union Oil Co. of Calif.) discloses a hydrodesulfurization process, operating at low pressure (atmospheric-100 psig) and with low hydrogen rates. Vaporized naphtha is contacted at 600-700°F, a space rate of about 1 V/V/hr. and a hydrogen rate of less than 300 cft/bbl with a catalyst comprising 10-20% nickel oxide on an acid washed montmorillonite clay carrier. After the catalyst has contacted 0.5-2 parts by wt. of gasoline, it is regenerated with air at 900-1200°F. A cobalt titanate catalyst is employed by C. E. Johnson and W. J. Zimmerschied (2,764,526 to Standard Oil Co. of Indiana). This catalyst is prepared by calcining at 1400-2000°F cobaltous carbonate with titania in amounts such, that the molar ratio of Co to Ti in the mixture is about 2:1. A two stage process, employing a platinum and a cobalt molybdena catalyst is disclosed by V. Haensel in 2,770,578 (to Universal Oil Products Co.). Unsaturated, sulfur containing hydrocarbons are treated with hydrogen, first over the platinum catalyst at 200-450°F, then over the cobalt-molybdena catalyst at 400-750°F.

A group of Esso Research & Engineering Co. patents covers various phases of hydrodesulfurization. In 2,760,906 W. F. Arey, Jr. and C. N. Kimberlin, Jr. convert ring type sulfur compounds in hydrocarbons by contacting the stream in vapor phase and in the presence of added naphthenes with a hydrogen transfer catalyst, such as 10% vanadium oxide on alumina. S. B. Sweetser, S. O. Bronson and J. Weikart (2,761,816 and 2,761,817) hydrodesulfurize high boiling hydrocarbon mixtures over a cobalt molybdate catalyst, which has been presulfided by contacting it at 550-650°F and 200-800 psi for 8-36 hours and in the presence of 500-3000 cft of H_2/bbl with the 2-6% sulfur containing oil. Desulfurization then proceeds at at least 50° higher temperature. Sweetser and Weikart (2,769,754) desulfurize gasoline and gas oils derived from coking of residua, in a combined stream in a mixed liquid-gas phase operation at 650-700°F. The product is passed to a hot separation zone, where hydrocarbons boiling below 400-750° are separated as vapor phase.

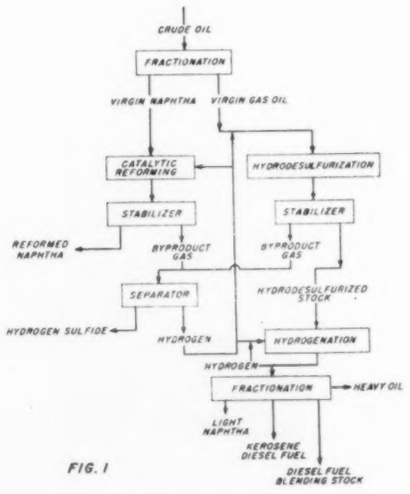
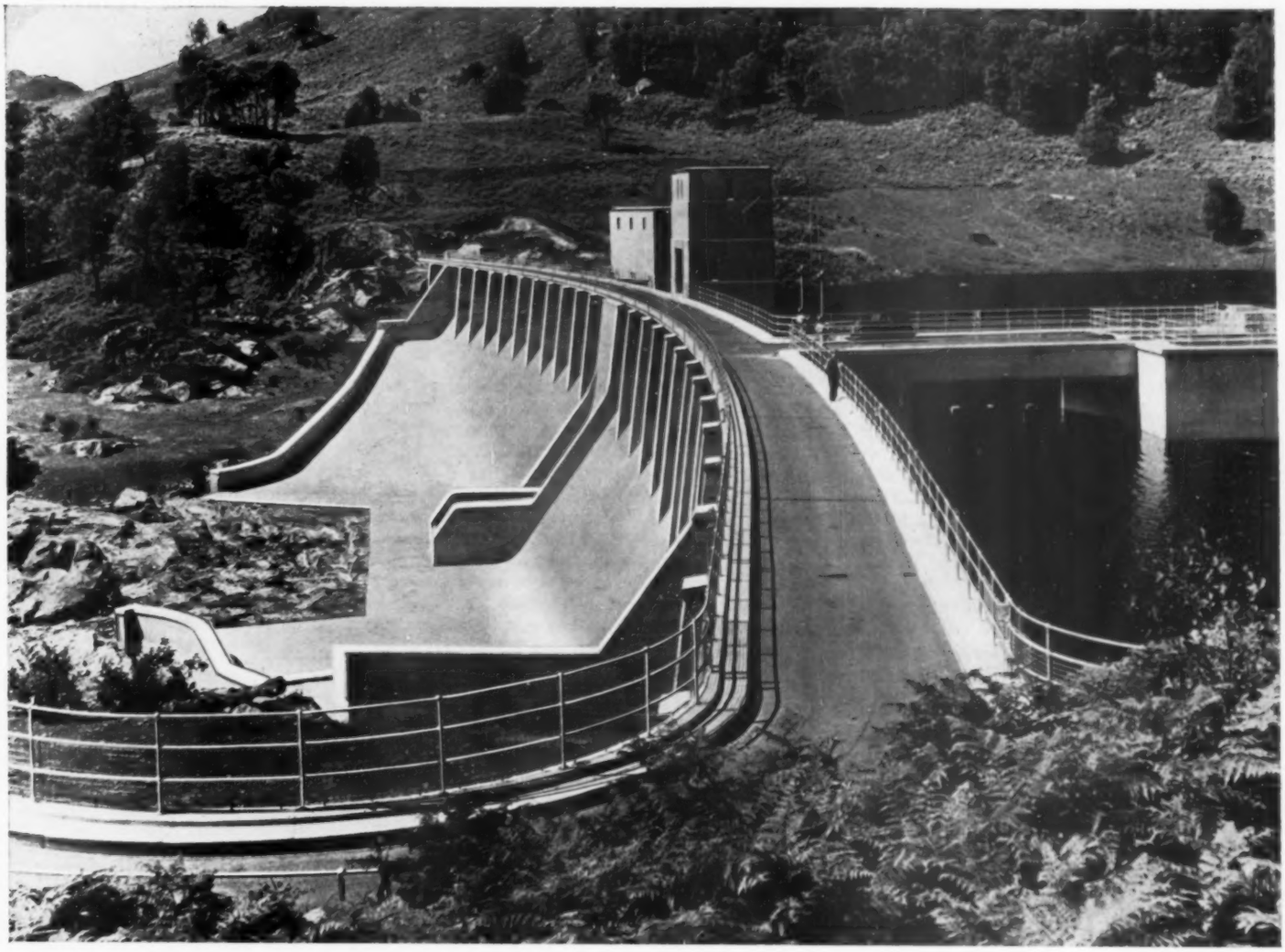


FIG. 1



Luichart Dam, one of the six main dams in the Conon Valley Project of the North of Scotland Hydro-Electric Board which will eventually produce 290 million units p.a. BP Energol turbine lubricants are used in all the Project's Power Stations.

BP AIDS SCOTLAND'S HYDRO-ELECTRIC PROJECTS

BP ENERGOL turbine lubricants are supplied to all the power stations of the North of Scotland Hydro-Electric Board.

Among these power stations are the six which figure in the Conon Valley Project in Ross-shire. These when completed will have a total installed capacity of 167,000 Kilowatts. Four of them are already in operation.

The British Petroleum Company is proud that its lubricants should have an important part to play in this great contribution to Scotland's present and future prosperity.

BP Energol Turbine lubricants are only one group among the many BP products that are speeding the wheels of progress all over the world.

The BP Shield is the symbol of the world-wide organisation of

The British Petroleum Company Limited

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Liquid phase products are passed with hydrogen through a secondary zone at 700-750°. High ash content, high sulfur crude oils and crude oil fractions are, according to G. R. L. Shepherd's 2,771,401 passed to a first contacting zone, containing spent silica-alumina cracking catalyst. Conditions are 750-850°, 0-500 psig, 2-40 moles of H_2/mole of oil. The reactor effluents is then treated over cobalt molybdate at at least 30° lower temperature.

Hydrodesulfurization of highly olefinic gasolines is the subject of two Hydrocarbon Research, Inc. patents. P. W. Garbo (2,774,-717) proposes to pass such gasolines, containing also large amounts of cyclic sulfur compounds, over an aluminum silicate catalyst at 875-950° and 100-400 psig at a space rate of 0.5-5 V/V/hr. to produce low sulfur gasolines of highly olefinic character. According to 2,774,718 (C. A. Johnson, S. C. Schuman and E. L. Johanson) the olefinic, sulfur rich (more than 1%) gasoline is contacted together with hydrogen with a high surface area alumina, containing a catalyst promoter, comprising a metallic element of groups VA, VIA, and VIII. Cobalt and molybdenum are suitable promoters. An aluminum silicate may be used as the support instead of alumina. The gasoline product is highly olefinic and contains less than 0.1% sulfur.

L. E. Hutchings and M. M. Marisic in 2,769,753 (to the Pure Oil Co.) describe a combination process to improve motor fuel characteristics and decrease the sulfur content and aromaticity of fractions obtained from a high sulfur crude (see drawing). The fractions are separated into a light fraction with an initial boiling point of about 200°F and a heavy fraction with an I.B.P. of about 350°. The farmer is catalytically reformed, the latter is hydrodesulfurized and the product hydrogenated at 300-700°F to dearomatize it. A high cetane number fraction is cut from the product. According to another Pure Oil Co. patent (2,769,760 W. G. Annable and L. E. Hutchings) a high sulfur virgin naphtha is hydrodesulfurized over cobalt-molybdena-alumina or chromia-molybdena-alumina at 500-800° F and the desulfurized product is then chemically treated at 400-500°F and a space rate of 1 V/V/hr. with the same type of catalyst, but in the absence of hydrogen.

Chemical Desulfurization

An increasing number of patents deal with non-hydrogenative methods of desulfurization, without being limited to sweetening. These are discussed in this section.

R. H. Brown, J. H. Krause and T. B. Tom (2,768,930 to Standard Oil Co. of Indiana) refine a sour, virgin kerosine or heater oil by (1) solvent extraction with 25-100 vol.% liquid sulfur dioxide at 0 to 30°C, (2) contact of the raffinate with formaldehyde in the presence of liquid SO_2 and an acidic condensation catalyst, such as sulfuric acid, and (3) separation of raffinate and extract phase. D. A. J. Noble (2,749,284 to British Petroleum Co.) reacts a sulfur containing kerosine or gas oil fraction with 5-15% of a peroxide containing product at 50-180°C. Sulfur compounds are oxidized and removed by distillation. The peroxide containing product is obtained by air oxidation of a sulfur-and aromatic free, paraffinic kerosine fraction at 100-150°C.

The production of special, non-corrosive solvent naphthas is disclosed in three Pure Oil Co. patents. W. G. Annable, L. E. Hutchings and K. Lucas in 2,769,762 contact hydrocarbons containing corrosive sulfur compounds with bauxite at 650° and a space rate of 1 V/V/hr., terminating the contact before hydrogen appears in the effluent. The products are then fractionated. According to 2,769,763 (W. G. Annable and R. M. Haines) products containing not more than 0.16% S are prepared from highly refined hydrocarbon fractions by contact with silver molybdate at 400-500°F. In 2,769,764 W. G. Annable proposes contact with cupric acetate or basic cupric acetate to reduce the sulfur content of highly refined fractions to less than 0.025%. Temperatures of 400-500°F are employed. An Esso Research and Engineering Co. patent (2,768,932, G. P. Richard, J. Stein and P. G. B. Hobsbawn) discloses the production of non-corrosive naphthas from hydrofined or autofined products by treatment in the vapor phase at below 350°C with finely divided metallic copper or a copper containing alloy. The catalyst is periodically regenerated with air and steam.

A. P. Stuart (2,767,120 to Sun Oil Co.) refines mixtures of hydrocarbons and non-hydrocarbons by treatment with BF_3. Sludge formed is separated from the hydrocarbons, which are then extracted with a solvent, such as acetic acid, dimethyl formannide, or methylacetate, water washed and dried. According to another Sun Oil Co. patent (2,758,058 A. Schneider and J. L. Jezl), a mineral oil, containing mercaptans is refined by contact with 0.001-5 wt.% of compounds like acrylonitrile and certain substituted acrylonitriles. The treatment may be in the presence or absence of an alkaline material. Lower temperatures (below 200°F) are employed in the presence, than in the absence of alkaline material (300-500°F).

Treatment of sulfur containing hydrocarbons at 500-800°F and 300-900 psig with an iron group carbonyl is proposed by C. N. Kimberlin and R. B. Mason (2,756,182 to Esso Research & Eng. Co.). The treatment is carried out in the presence of a particulate solid of large surface area, such as activated charcoal. The carbonyl decomposes to metal and CO. The metal forms insoluble sulfides, removing sulfur compounds. E. Arundale (2,746,908 also to Esso Research & Eng. Co.) removes sulfur compounds from a petroleum distillate, boiling below 700°F, by adding 0.1-1.5 wt.% formaldehyde or acetaldehyde and subsequently contacting the mixture with a solid acid catalyst at 75-500°F. Silica-alumina, solid phosphoric acid, etc. are suitable catalysts.

Several patents deal with sodium refining. J. F. Walker (2,748,058 to E. I. du Pont de Nemours & Co.) treats sulfur containing hydrocarbons in liquid phase with 1-5 atoms of sodiummper atom of sulfur present. The resulting product is treated with an aqueous solution of formaldehyde, containing 1-5 moles of aldehyde per atom of sodium used. B. M. Vanderbilt and J. P. Thorn in Esso Research & Engineering Co.'s 2,773,805 describe treating cracked naphthas with sulfuric acid or dilute aqueous formaldehyde. After separating the naphtha from sludge formed, it is treated in a fluidized operation with sodium on a solid support, such as sodium carbonate.

Sweetening

Weakly acidic, organic materials, such as mercaptans can be removed from petroleum fractions according to 2,742,402 (L. M. Browning to Socony-Mobil Oil Co.) by contact with a finely divided solid anhydrous alkali metal hydroxide reagent, prepared from an aqueous solution, containing 20-70% alkali metal and 0.02-0.135 lbs. of alkyl phenols per pound of alkali metal hydroxide. C. J. G. Leeseman (2,763,593 to Esso Res. & Eng. Co.) treats hydrocarbons containing normal, primary, secondary and tertiary mercaptans and olefins by exposure to radiation of a wave length of 1850-3600Å. Tertiary mercaptans are removed by reaction with olefins. The remaining mercaptans are extracted by washing with an aqueous alkaline hypochlorite solution.

A solid extractant for mercaptans is claimed in Shell Dev. Co.'s 2,748,059 (A. C. Nixon and H. B. Miner). This consists essentially of active carbon, which has been impregnated to saturation with an aqueous solution of 10-30% NaOH and dried at 80-200°C to reduce the water content to less than 85%. The weight ratio of water to NaOH in the final solid is 0.75-1.75. With this ratio range an optimum volume of sweet raffinate is obtained (see accompanying graph).

Sour hydrocarbon distillates can be sweetened by treatment with a phenylenediamine compound in the presence of sodium phenolate and air, according to 2,744,055 (F. C. Moriarty and F. G. Graves to Universal Oil Products Co. and California Research Corp.). L. V. Sorg (2,766,181 to Standard Oil Co. of Indiana) improves the gum stability of an inhibitor sweetened, cracked naphtha by adding 2-20 lbs. of phenylenediamine per 1000 bbls and contacting the mixture with at least enough caustic solution to form a distinct aqueous phase in the presence of free oxygen at 80-100°F.

A British Petroleum Co. patent (2,757,127, F. W. B. Porter and R. P. Northcutt, see drawing) suggests removing hydrogen sulfide from hydrocarbons, before it can react with olefins to form mercaptans. The hydrocarbons, containing H_2S are treated with a gas, essentially free of oxygen or oxygen compounds reactive with H_2S, below 100°C. Hydrogen rich gases or nitrogen may be used. According to another British Petroleum Co. patent (2,759,873) E. McNeill and

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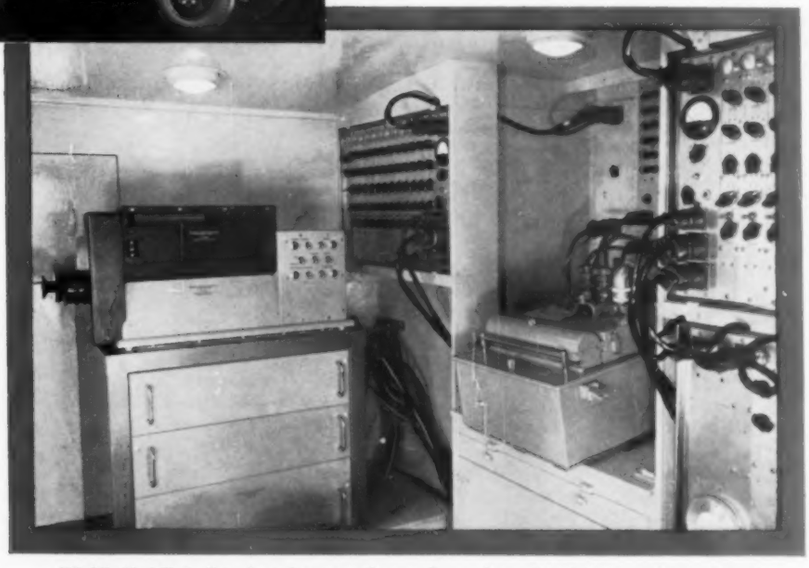

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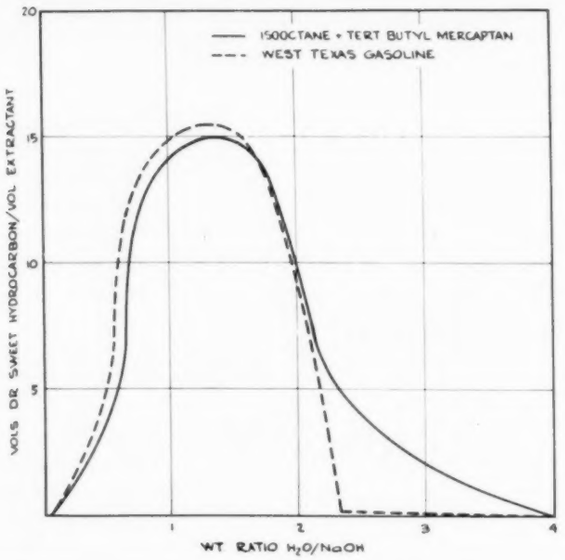
SEISMIC GRAVITY MAGNETIC SURVEYS

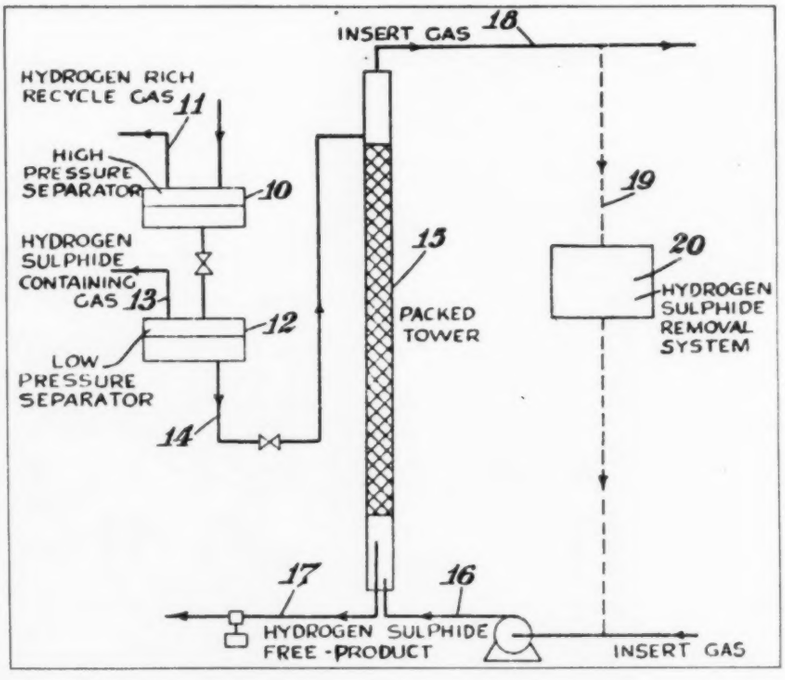
R. I. Boyle sweeten petroleum distillates by contacting them with a raw montmorrillonite clay, such as fuller's earth at 180-220°F. using between 0.05 and 0.5 lbs of clay per gallon of distillate. The treated distillate is subjected to copper sweetening.

R. L. Betts, R. F. Corning, H. A. Ricards and J. W. Ryder (2,769,765 to Esso Research & Eng. Co.) remove mercaptans from catalytically cracked and virgin oils by washing the cracked oil with an alkali metal hydroxide solution, containing less than 30% alkali metal hydroxide, withdrawing spent solution from the washing zone, passing it to a concentration zone, and concentrating it to a hydroxide equivalent of 40-60%. The virgin oil is then contacted with the concentrated mercaptide containing solution. A non-corrosive product is prepared from a sweetened hydrocarbon mixture according to Pure Oil Co.'s 2,775,545 (W. J. Sandner and W. L. Fierce). The mixture containing sulfur compounds, including disulfides, is distilled in the presence of an alkylene oxide and an oil-soluble basic salt of a high molecular weight organic acid.

Standard Oil Co. of Indiana is the assignee of a number of sweetening patents. M. L. Kalinowski and R. F. Schnaith in 2,768,885 describe contacting a sour cracked naphtha with a granular catalyst, consisting of cupric chloride, water and a carrier, wherein the water content is between 15 and 25% of the catalyst and the weight ratio of carrier to cupric chloride is between 12:1 and 15:1. Contact is at 70-90°F in the presence of enough free oxygen to convert essentially all mercaptans. R. C. Arnold (2,744,855) desulfurizes oils by: (1) treating the oil with oxygen-copper chloride to eliminate mercaptans; (2) extracting the mercaptan-free oil with liquid sulfur dioxide and a promoter (Friedel-Crafts metal halide); and (3) separating a refined raffinate from an extract phase.

A two-stage process for mercaptan removal from a thermal naphtha is described in Standard Oil Co. of Indiana's 2,754,251 (M. Gordon and R. C. Mallatt). In the first stage the naphtha is treated with caustic solution, containing a polyhydroxybenzene catalyst in the presence of free oxygen. The mercaptan content is reduced to a level of about 5 mercaptan number. The second-stage treatment is with aqueous caustic cresylate solution in the presence of free oxygen. In the same company's 2,766,180, M. L. Kalinowski proposes to eliminate the separate regeneration procedure of the conventional Doctor process by using as a sweetening agent a Doctor solution containing an effective amount of an alkanolamine, which has from 2-3 C atoms in each alkyl group. The free sulfur-oil-treating agent mixture is contacted with free oxygen for a time sufficient not only to sweeten the oil, but also to convert the lead sulfide formed to soluble plumbite. A. Gislon and J. Quiquerez in 2,759,874 (to Co. Francaise de Raffinage) claim removal of mercaptans from hydrocarbons by: (1) treatment with caustic soda solution, (2) treatment of the product from (1) with a solution of sodium plumbite to form hydrocarbon soluble lead





mecaptides, (3) separating hydrocarbons from the aqueous phase, (4) treatment of the hydrocarbon phase with air at 120-150°C to precipitate lead oxide and form hydrocarbon soluble disulfides.

W. F. Ambler's patent 2,768,931 (to Sinclair Refining Co.) deals with the Bender process. Lead values, normally lost from the catalyst bed during operation of the process, can be supplied by addition of litharge to the charge stream, containing the water, caustic, sulfur and oxygen. This extends the processing time between reactivations and reduces losses, normally incurred in rejuvenating the catalyst bed.

Two Shell Development Co. patents are concerned with the oxidation of mercaptans to disulfides. In 2,763,594 C. D. Ten Have speeds the reaction by using aqueous alkali metal hydroxide solutions, which contain phenolates and which have a water content of not over 54% by volume. Monohydroxyphenolates are employed, which contain only C, H, O and K atoms and 6-9 C atoms. W. J. Peters (2,744,054) carries out the oxidation in a 2 phase system, one phase of which is formed by a hydrocarbon oil and the other by an aqueous alkali metal hydroxide solution. A peroxide is present (in 10-40% of stochiometric amount), as well as free oxygen in a quantity of no more than 130% of stochiometric amount.

A continuous method for separating mercaptans from hydrocarbons is disclosed in Standard Oil Co. of Ohio's 2,779,712 (H. M. Stine). A microporous, permeable carbon barrier layer is disposed between conduit means for flowing hydrocarbon stock in contact with one surface of the layer and conduit means for flowing an aqueous alkali metal hydroxide solution in contact with the opposite surface of the layer. END

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OIL IN THE SAHARA

(Continued from page 37)

as is done in the Persian Gulf. Although costing twice as much as the Libyan, the longer Tunisian route is to get first claim. The French government has started negotiations with the traversed countries in regard to right-of-passage and loading royalties. And they prove tough bargainers.

Big Gas Deposits: CREPS also envisages eventually the construction of another 800-mile 20-in. pipeline to move the gas production of the Ahnet and Tidikelt basins, in its deep south Saharan block of leases, to Algiers and Oran. Toward the end of 1953, a wildcat located on seismic survey on the Djebel Bergha, 50 miles S-W of In-Salah, traversed the whole Paleozoic series to the Ordovician, to unblock at about 4,500 ft a considerable methane deposit from a porous Devonian limestone reservoir. A drill-stem test in open hole flowed 21 million cubic feet daily. Subsequently, further condensate-bearing methane deposits were uncovered at En Bazzene—I Thara and on the Djebel Djoua. They have been potentialled for an aggregate 14 million cubic feet per day. No development of these deposits is contemplated in the near future because of their geographical remoteness in relation to consuming centers.

When the more favorably located deposits are tapped, a $150 million pipeline will be laid to move 140.8 billion cubic feet of gas a year across half Sahara's length to Algiers and Oran for a 1.2-million-ton-per-year steel plant at midway Colomb-Bechar (large iron-ore and coke resources). Ahnet reserves are reported at 7.04 trillion cubic feet of condensate-bearing gas—a 50-year supply for North Africa and source of a large petrochemical industry.

Thus, CREPS is concentrating its main exploration effort on the Ahnet basin which geophysical, gravimetric, and magnometric work has shown to extend in a northerly direction under the Intercalary Continent. Seismic work has established the existence here of several large anticlines, with extensive drainage areas and good coverage rocks favorable for the accumulation of oil. Extensive drilling has confirmed the interest of the Lower Devonian, and had revealed the possibilities of the Upper Devonian and Ordovician. Several wells have resulted in a good flow of crude, but the operator has not disclosed their location. This section of the Sahara might make hot news in the not too distant future.

To the north of the CREPS concession, CPA, a Shell subsidiary, has greatly stepped up exploratory work—putting in the field two gravimetric and three seismic crews, and keeping busy one light Emsco GB 160 and two medium unit U 15 and Ideal 50 rigs. So far, only one show of hydrocarbons was logged at a depth of 3,500 ft from the Fammenian at Irharen, 62 miles S-E of Timmoun; but this has not led to any commercial find. A wildcat of Hassi Jokka revealed the existence of a potentially oil-bearing sandstone series, but I Kerboub showed the reservoir rocks to have no productive porosity.

Development Program: In 1957, SN Repal will be drilling a whole series of 100 exploration and extension wells to establish methodically the definite boundaries of the new productive area at Hassi-Messouad, while Hassi R'Mel will come in for a good deal of probing. The number of rigs kept active in the area has been increased eightfold.

The promising oil shows logged at I GM have induced SN Repal to explore its Oued Rharbi concession, stretching roughly midway between the Moroccan border and its Berriane concession. I OR and II OR, spudded at some 200 miles S-W of Laghouat, on the self-same Oued Rharbi structure, located on seismic work previously encountered good stains from several limestone reservoirs in the Lower Devonian, characterized by favorable porosity and permeability.

Hassi R'Mel has greatly spurred CFPA to test systematically its nearby Erg El Abgheur concession. I AB, 50 miles due west of Ghardaia, got good gas shows from the 7,637-ft to 7,702-ft interval in the Trias. Deeper additional gas pay, showing some distillate, was penetrated between 7,977 ft and 8,018 ft in the Gothlandian. The test is currently coring below 10,744 ft. I AG and I AJ are currently drilling below 3,000 ft and 3,063 ft, both in the Intercalary Continent.

In the winter of 1957 the French government's Bureau des Réchèrches des Pétroles, known as BRP, is to pursue its reconnaissance of the Chech area, in the Touat region, about midway between the Ahnet basin and the tremendous Tinduf iron-ore deposits, where the borders of Algeria, Morocco, Mauretania, and the Spanish Rio de Oro meet. This area came in for 1,700 ft of core drilling for geological information in 1955, and 7,500 ft in 1956.

A total footage of 224,624 ft was cut in the Sahara in 1956, as against 12,500 ft in 1954. For 1957, the drilling will be boosted to well over 500,000 ft, as compared to the overall 381,000 ft spudded from 1946 to 1956. Last year, $57 million went into exploration, as against an already appropriated $75 million for the current year.

Gravimetric and seismic crew work-weeks are expected to jump from a shade under 2,000 to over 2,500 for the period under review. Seismic refraction work in some areas, detailed geological and geophysical studies in some others, have already defined the main structural trends over the local sedimentary basins. The exploration effort now has been narrowed down to "high." To stake likely drilling locations, seismic reflection is to be resorted to increasingly.

Applications Welcomed: It must be stressed that this considerable spade work has so far taken in only an aggregate 280,000 square miles, covering the total acreage of all four major companies active in the Sahara. In addition, a further 110,000 square miles of concessions applied for have been summarily studied. Both types of areas cover about 44% of the 800,000 square miles-plus of the Saharan sedimentary terrains. In the remaining 56%, BRP has not even begun to scratch the top, with its quickie reconnaissance and some measure of core drilling to draw the attention of risk capital to their possibilities.

Thus, well over 400,000 square miles of potentially oil-bearing territory are not yet covered by permits. Furthermore, in keeping with France's mining law, the four concession holders are to re-apply, in June 1957, for half of their total acreage, after a first five-year term. The French government has voiced its readiness to grant preference to likely new applicants in regard to the released acreage, so as to spur exploration and "avoid the sterilization of vast stretches," as the *Journal Officiel*, the French Hansard, elegantly has put it.

Admittedly, the exploration and development of these forbidding stretches are a costly and difficult undertaking. But the 1.4-billion-plus barrels of reserves believed to have been uncovered here act as a powerful stimulus. According to some French oil men, the bulk volume of the Saharan reservoirs would give a fairly good idea of their overall possibilities. It is reportedly estimated at about one-quarter of the Middle Eastern reservoir bulk volume, which contain 60% of the world's known reserves.

To offset this, they admit that the Middle East's exceptionally favorable conjunction of all the factors controlling oil accumulation is not present in the Sahara. Thus, the reservoir rocks act here as a fairly small impregnated sponge. Permeability and porosity are not so favorable. Such features would cut by half the productivity of the local reservoirs. According to this line of reasoning, it is reckoned that the area would offer about one-eighth the Middle East reserves, and this would still represent some 15 billion barrels, or about 7.5% of the world's known reserves. According to them, the Sahara would thus rank on a par with the whole of Latin America.

Perhaps they have failed to take sufficiently into account in their speculations one vital factor—the fabulous initial richness of the Middle East source rocks. Perhaps the Sahara is not so favorably endowed in this respect. A careful evaluation of all factors involved would tend to show that it is surely not another Saudi Arabia, and most probably not even another Venezuela. Yet it is inconceivable that Hassi Messouad, Hassi R' Mel, Talmezane, Edjele, and Tinguentourine are isolated discoveries, because the horizons in which the crude was found are known to exist over widespread areas here. The wilderness doubtlessly contains a number of other prolific deposits waiting to be tapped. Their reserves are sure to pay off handsomely, even if exploration and development were an expensive and tough proposition here. END

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Latin American Oil News

First Offshore Concession In Guatemala

Early in March Guatemala granted the 37th oil exploration concession to be given out in the past 18 months. The Central American Oil and Mining Co., a US firm, received rights for an area covering more than 12,000 acres over the surface of Amatique Bay on the Caribbean coast. It is the first offshore exploration concession which has been granted by Guatemala.

Esso To Form Paraguan Affiliate

Esso of Argentina is soon to set up an Esso company incorporated in Paraguay, it was announced bv Saul Di Santi, director of operations in Paraguay for Esso Sociedad Anonina Petrolera Argentina. The Paraguayan compny will be independent of the Argentine company, and would take over all properties and functions of the Argentine company in Paraguay.

Venezuela Expands Petrochemicals

In addition to the research refinery planned for Moron on the Caribbean coast, the government will start a second plant late in 1958 for commercial production. This is in connection with the government's petrochemical program.

Venezuelan Crude Output 2.7 Million B/D

Crude production in Venezuela during January 1957 was 86,555,879 bbl. Natural-gasoline production was 106,062 bbl, and butane production 71,832 bbl. Throughput of crude and products for blending came to 21,362,000 bbl. Crude exports were 65,541,549 bbl, of which the USA received 17,094,402—more than any single destination. Then came Aruba, with 14,752,560; Curaco, with 9,274,278; and Canada, with 7,611,642 bbl.

Two Companies In Peru Complete 175 Wells

Two oil companies completed 175 wells in Peru during 1956; 93 were by Cia. Petrolera Lobitos, and 82 by International Petroleum Co. A total of 139 was oil wells, 13 gas, and 23 dry holes. Cia. reported 77 oil wells, one gas well, and 15 dry holes. International reported eight exploratory wells, of which six were oil wells and two dry holes. International also reported 56 oil wells, 12 gas wells, and six dry holes.

A total of 22 drilling rigs was operating at the start of this year. Cia. had 12 of them, and one more in a joint operation; International had seven, and Empresa Petrolera Fiscal two.

A total of 3,486 producing wells was reported at the start of this year. International was reported with 1,929; Cia. with 1,410; and Empresa with 147. International reported a total of 4,688 wells, which includes the producers, as well as wells shut in, wells abandoned, and wells awaiting to be abandoned.

A total of 13,396,305 bbl of oil products was handled in domestic marketing during 1956.

Four new operating companies—Douglas Oil, Petrolera Peruana, Peruvian Pacific Petroleum, and Petrolera Amotape SA—showed a total output of crude of 263,390 bbl for the year.

Consortium To Build Refineries, Pipelines

The Argentine government's YPF has received bids from International Contractors and Suppliers Assn. for the construction of a refinery and pipeline system to cost some $268 million. The new international consortium is composed of 33 companies, of which two are American. Linkage of the Buenos Aires area with the oil fields in the extreme northern part of the country and the extreme western part should, by 1960, double the present annual domestic oil production of some 94,000 b/d.

Brazil's Marica Island Tests High

Colonel Nunes, head of Petrobras, has reported that, at wildcat No. 2-AZ on Marcia Island, where 44.1-gravity oil had been found on February 23, bottom-hole pressure under test rose to 2,555 lb in 14 min from 1,975 lb, and continued rising. Oil came from 20 ft of highly porous pay, topped at 8,894 ft.

Peruvian Wildcat Strikes Oil

The German consortium Elwerath-Deutsche Erdoel AG-Wintershall, with Peruvian El Oriente, has discovered oil in wildcat Maquia No. 1, at 2,100 ft. Maquia is on the Ucayali River, some 90 miles north of Ganzo Azul, hitherto the only field in Peru east of the Andes. Flow of about 11 bbl per hour of 39 API oil was through a $\frac{3}{16}$-in. choke, or 22 bbl per hour through a $\frac{1}{4}$-in. choke. Production was from the 200-ft-thick upper sugar sandstone. Further tests will determine whether deeper sugar sandstones are productive. Previous tests were unsuccessful.

To Drill Victoria Site, Costa Rica

A subsidiary of Union Oil Co., Compania Petrolera de Costa Rica, plans more drilling for oil in Costa Rica, according to Joel Lloyd, the company's manager. The company quit work on Cocoles No. 3, at 5,700 ft, which had been begun February 10, without striking commercial deposits of oil, but only small showings of petroleum and gases. The company plans to start drilling at the Victoria site, near the rail junction of Liverpool in July or August. The Victoria site is about 11 km from Liverpool, and Liverpool is about 10 km from the port of Limon. Union already has begun construction of an access road from Liverpool to the Victoria site at an estimated cost of $1 million (Costa Rican). One US dollar equals 6.60 CR.

New Venezulelan Firm Obtains Concessions

The recently formed Corporacion Venezolana de Minas has been awarded two more exploitation concessions—each of about 25,000 acres. One is Barinas block 5, on which it had bid about $1,400 per acre. The other is South Monagas block 11, on which it had bid about $1,600 per acre.

Esso To Close Salta Camp

Esso Argentina SAPA plans to close its central camp at Salta, where it is producing about 500 b/d of crude, by September. Some 300 employees are at the site; and about half have been given notices of termination, with the option of working until September or taking six months' pay and quitting. Most chose the latter.

The company explained economic reasons call for the closing—adding the concession area has been worked over; that no drilling has been done for some time; and that the company has been unable to obtain additional concession areas for exploration and development. The field is reported to have a life of six to seven years from present oil wells. Esso continues to drill in its concession in Neuquen, and will continue camps at San Pedro, Lomitas, and Vespucio.

Halliburton Moves Abell To Argentina

Halluburton Oil Well Cementing Co. [illegible] announced offices are being opened in Buenc Aires for Halliburton Argentina SA. J. K. "Ken" Abell, who has been manager for Cia. Halliburton in Venezuela, is transferring to Buenos Aires to open operations in Argentina, Boliva, Brazil, and Chile.

A native of Kansas, "Ken" Abell takes with him to Argentina a brand-new 20-year Halliburton service pin given to him by Ralph R. Emery, vice president for foreign operations and export sales of the pioneer service company. The 20 years began in April 1937 at Hutchinson, Kans.

Roy Gee

Halliburton Venezuelan Manager

Roy Gee is now Venezuelan operations manager for Cia. Halliburton de Cementacion y Fomento, one of the South American subsidiaries of Halliburton Oil Well Cementing Co. A Texan, with 25 years service, Mr. Gee has worked for Halliburton in the USA, the Far East, Mexico, Chile, and Venezuela. He will be stationed at Jusepin.

Pemex To Borrow French Capital

Petroleos Mexicanos is talking of borrowing up to $200 million from two French banks. Some $134 million would be cash loaned on long terms, and $66 million would be in refinery equipment from France. Under the deal, as reported, France would buy more crude oil and products from Mexico. Banks named are Banque de L'Union Europienne Industrielle et Financiere and Banque National pour le Commerce et L'Industrie. One source said talks were "in a preliminary stage," and another that the general terms had been settled and announcement due soon.

Uruguay Uses 23,000 B/D Of Oil Products

Consumption of oil products in Uruguay came to 8,471,000 bbl during 1956. Imports of crude came to 7,603,000 bbl. Exports of products totaled 1,865,000 bbl. More than 90% of product exports is for bunkers. Lube-oil imports in 1956 came to some 1,648,000 gal, and 100,000 gal of greases. Dutch West Indies sent 1,219,000 gal of the lube oils. Crude-oil stocks at the first of 1957 were 508,000 bbl, and of products 672,000 bbl.

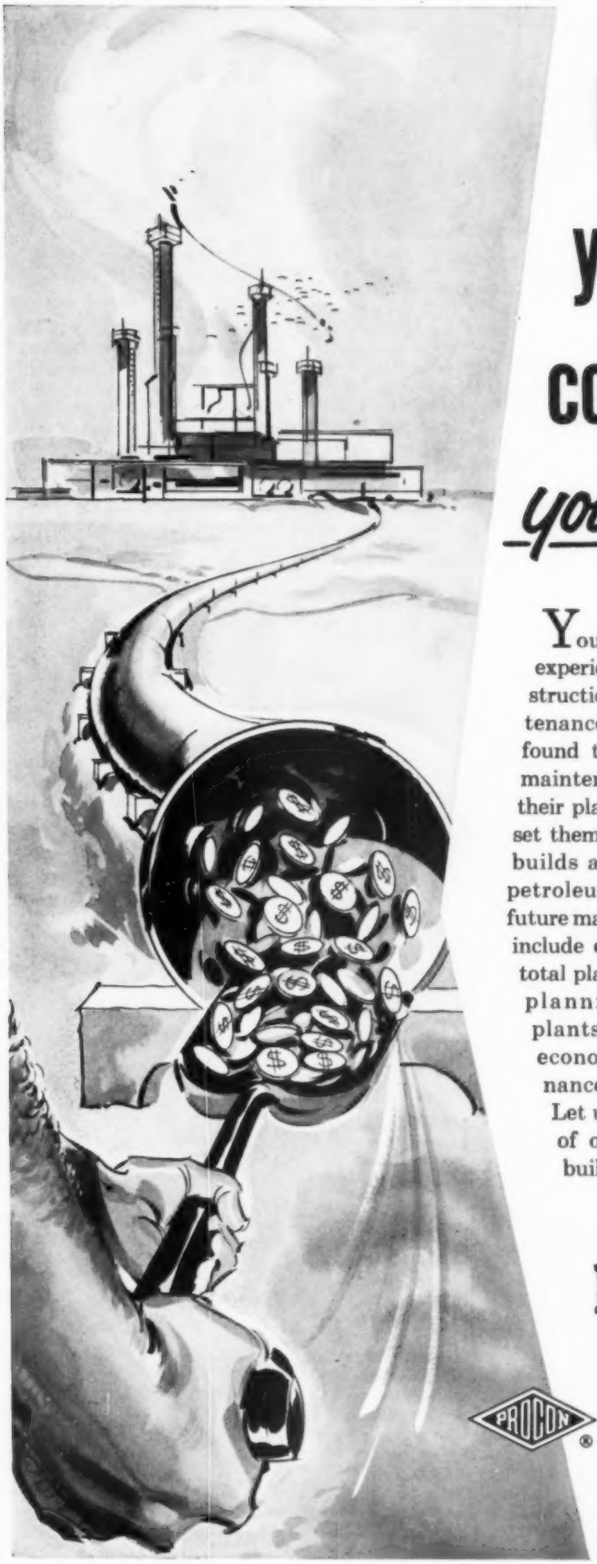
Kerr-McGee To Drill In Venezuela

Kerr-McGee Oil Industries Inc. will begin contract drilling in Venezuela late this summer, with two lake Maracaibo type drilling tenders under construction by Leginston Shipbuilding Co. at Orange, Texas. Keer-McGee will open an office in Maracaibo under Leo LeBron, at present Kerr-McGee marine superintendent.

First of the two tenders will drill for a group of American firms headed by Sun Oil Co. The second tender, scheduled for delivery in late July, will drill for another combine of which Phillips Petroleum Co. is the largest interest holder and is the operator. Also being built for Venezuelan service by Kerr-McGee are nine crewboats and two workboats. The tug "Senator," now in use on the Gulf Coast, will be taken to Venezuela.

Cuba's Platformer Onstream

A UOP Platforming unit, first built in Latin America, has gone onstream at the refinery of Cia. Petrolera Shell de Cuba SA, with a design capacity of 5,500 b/d. The Platformer will process crudes. The unit is designed to produce a 97-octane gasoline blending component.



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Oil Company Staff Changes

C. A. SWIGART, board chairman of Trans-Arabian Pipeline Co. (Tapline), will retire after 6½ years' service in the Middle East. Mr. Swigart will live in San Francisco.

I. E. BOBERG, chief engineer of the Chicago Bridge & Iron Co., Chicago, has been elected a vice president of the company. Leo J. Marcoux, controller, is secretary. Mr. Boberg joined CB&I in 1924. He has been chief engineer since 1945.

GLEN HORRIE has been appointed assistant export manager of McCullough Tool Co.—with headquarters at the Los Angeles general office. His appointment will be of material aid to the company's policy of development of the use of McCullough's technical tools in foreign oil fields.

JOHN E. SWEARINGEN, executive vice president of Standard Oil Co. (Indiana), has been elected a member of the American National Bank and Trust Co. of Chicago.

W. S. ANDERSON has been appointed manager of the Rocky Mountain Oil Show, scheduled for September 19, 20, and 21 at Casper, Wyo.

MILO M. BRISCO and Henry F. Stevenson have been elected to the board of International Petroleum Co. Ltd., Toronto. Mr. Brisco is International's executive representative in Colombia. Before being named to International's board, Mr. Stevenson was an assistant general manager of Imperial Oil Co.'s marketing department.

JAY A. PRITZKER has been elected a director of Douglas Oil Co. Los Angeles, Calif.

DR. F. W. LOHMANN has been appointed vice president in charge of engineering and research of Diesel Energy Corp., New York. The New York concern is the sole USA representative of Kloeckner-Humboldt-Deutz AG, of Cologne, West Germany, distributors of Deutz diesel engines.

S. Z. NATCHER has been appointed manager of the public-relations department of Standard Oil Co. of California; San Francisco.

A former assistant manager of the department, Mr. Natcher for the past two years has been serving as president of Iran California Oil Co., California Standard's subsidiary in London. He joined Standard as a public-relations man in San Francisco in 1938, after a number of years with other oil-industry organizations, and was named as assistant manager of the department in 1944. Mr. Natcher was appointed assistant to the vice president, conservation, in 1947—with headquarters in Los Angeles. In 1954 he was assigned to London as resident head of Iran-cal, which manages Standard's interests in the Iranian consortium.

Born in Pittsburgh, Pa., Mr. Natcher was graduated by Stanford University in 1927 wit ha mechanical-engineering degree.

S. Z. Natcher

Arthur D. Gray

Dr. Hollis D. Hedberg

ARCHIE D. GRAY and **Dr. HOLLIS D. HEDB7RG** have been elected vice presidents of Gulf Oil Corp., effective April 23. Mr. Gray, general counsel of Gulf since February 1956, will become vice president and general counsel. Dr. Hedberg, exploration coordinator, since June 1953, will be vice president, exploration. Both men have long terms of service with Gulf. Mr. Gray became associated with Gulf's Law Department in Houston, Texas, in 1935. Dr. Hedberg joined Gulf in May 1928, in Venezuela, where he served as stratigrapher and later as assistant chief geologist until 1946.

PERCE E. ALLAN, administrative vice president for marketing of Tidewater Oil Co., has retired. He steps down from Tidewater's top marketing post after 42 year's service.

HAROLD S. BELL, after a world wide experience in the petroluem field, has opened an office as a consulting engineer at 744 Broad Street, Newark, N.J. He will offer his services to tankship operators and those departments of shore installations and to port authorities interested in off-loading and loading of vessels. Bulk terminals will receive especial attention. Mr. Bell is the author of **American Petroleum Refining,** now in revision for a fourth edition, and **Oil Shales and Shale Oils,** together with miscellaneous technical papers and articles.

A. J. BROGGINI has been elected the new president of Badger Manufacturing Co. in Cambridge, Mass. He succeeds George C. Hargrove, retiring. Mr. Broggini will continue as chairman of the executive committee and member of the board.

ROBERT F. CARROLL has been appointed manager of The Texas Co.'s insurance department. He succeeds S. E. McKee, who retired April 1 after almost 47 years' service with Texaco.

S. A. BERTHIAUME has been appointed assistant to the vice president in charge of The Texas Co.'s domestic producing department. Mr. Berthiaume, who has been assistant general manager of the department at Houston since January 1, 1954, assumed his new duties in New York on May 1.

W. M. ELMER has been elected executive vice president of Texas Gas Transmission Corp. He will continue to serve as president of Texas Gas Exploration Corp., and as a director of both corporations.

MILLARD K. NEPTUNE, formerly general manager of Sahara Petroleum Co., Egypt, will head up Texas Eastern Transmission Corp.'s expanding products pipeline division. He will make his headquarters in Shreveport, La., and will fill the newly created post of executive vice president, products division, in charge of all products pipeline operations.

T. L. KUNKEL has been promoted to chief geophysicist of The Texas Co.'s producing department. He started with Texaco in 1934, and served as computer and geophysical-party chief. He was appointed supervisor of field operations, geophysical division, in 1951, and in 1955, was named assistant division manager.

E. E. SIMMONS of Cree Drilling Co. Inc., Pampa, was elected chairman of the newly organized Panhandle Regional Chapter of the American Assn. of Oilwell Drilling Contractors at the first formal meeting of the chapter.

Eleanor C. Dickson

ELEANOR C. DICKSON has been elected secretary of Standard-Vacuum Oil Co., the first woman to hold this office. She succeeds Howard J. Schlereth, who is now serving in the White Plains headquarters as assistant regional coordinator for the company's Southeast Asia operations.

Miss Dickson has been assistant secretary for the past two years. She joined the company in 1935 upon completion of her studies at Barnard College. Her first assignment was in the accounting department as a stenographer. She next held a secretarial position in the law department, later moving to the office of L. V. Collings, now chairman of the board of directors.

Landon B. Derby

Edwin L. Gorham, Jr.

LANDON B. DERBY has been appointed assistant general manager of The Texas Co.'s foreign-operations department (Western Hemisphere and West Africa). Henry M. Hanbury will succeed Mr. Derby as manager of the foreign sales division, and Edwin L. Gorham, Jr., has been named manager of the foreign producing division.

J. RONALD GETTY has been appointed administrative vice president for marketing of Tidewater Oil Co. Elected a director of the company in February of this year, he now assumes the responsibilities formerly held by Perce E. Allen, who retired April 30 after 42 years' service. In this post, the company's top marketing assignment, Getty will make his headquarters in San Francisco.

Until recently he was managing director of Veedol GmbH, Tidewater's marketing subsidiary in West Germany. He was also manager of the company's export activities in Europe, the Middle East, and Africa. He continues as a director of Tidewater Oil Company (England) Ltd.

ROBERT B. CAPPS has been named division manager of the southern division exploration office of Kerr-McGee Oil Industries Inc., in New Orleans. He has been for the past three years a staff geologist in the company's Oklahoma City headquarters.

CORRECTION

PAUL M. YOUNGMEYER has been appointed assistant manager of exploration for the Venezuelan division of Texas Petroleum Co., wholly owned Texaco subsidiary. His offices will be in Caracas. Mr. Youngmeyer will be succeeded in Calgary, Alberta, Canada, as assistant manager of the Texaco Exploration Co. by Raymond D. Holland.

BASIL RAWDON JACKSON, who had retired as chairman of the British Petroleum Co. in January, died in a London hospital, March 29, at the age of 64.

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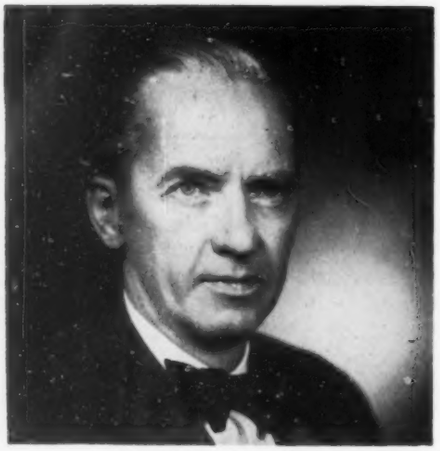


Garry Owen

GARRY OWEN has been elected vice president of Arabian American Oil Co. Mr. Owen will make his headquarters in Dhahran, Saudi Arabia, and will serve as Aramco's representative in discussions on company matters with the Saudi Arab government.

K. R. Webster, Dhahran district manager for the past six years, has been appointed director of local government relations.

In the Dhahran district, N. A. Scardino assumes title of district manager—with J. D. Symons as assistant district manager. Scardino has served as assistant district manager for two years, and Symons moved from his relief post as acting assistant director of industrial relations.

F. D. AARING has been appointed chief petroleum engineer and C. A. Buskel chief gas engineer for British American Oil Co. Ltd., in Calgary, Alta., according to announcement by the B-A production and pipeline department. Mr. Aaring formerly was division petroleum engineer for Canadian Gulf Oil Co., Calgary. Mr. Buskel served as division gas engineer at the Tulsa, Okla., division office of Gulf.

FRANKLYN M. MOFFITT has been elected vice president of the Ashland Oil & Refining Co., Ashland, Ky. He had been national account sales manager, and in his new capacity will have charge of sales of aviation fuels, railroad and industrial fuels and lubricants, petrochemicals, and other petroleum specialties.

JOSEPH W. MICHALSKI has been appointed manager of publicity for Sinclair Oil Corp. Mr. Michalski has been assistant business and financial editor of the *New York Herald Tribune* since April 1956, before which he had held a similar post with United Press Association for eight years. He joined the United Press in 1933 in its Kansas City, Kans., bureau, and was transferred to New York in 1936. He was named UP assistant business and financial editor in 1947. During World War II, he served for three years with the 13th Air Force Service Command as a radar and communications sections chief.

JOHN J. CASEY has been appointed manager of the real-estate division of The Texas Co.'s domestic sales department. Edward W. Jones, who had been manager since 1938, retired April 1 after 24 years with Texaco.

C. S. KILLGORE has been promoted to assistant regional geologist for Continental Oil Co.'s southern region, with headquarters in Houston. Formerly division geologist at New Orleans, he succeeds M. B. Morris, who recently was promoted to assistant manager of Conoco's headquarters geological section in Houston.

A. G. NAES has been appointed district manager of the newly established marketing district of Continental Oil Co.—with headquarters at Fargo, N. Dak.

FRANK R. MARKLEY, vice president of Sun Oil Co., has assumed executive responsibility for transportation functions. Mr. Markley was in charge of marketing.

Charles E. Webber

CHARLES E. WEBBER, technical advisor to the vice president, Sun Oil Co., Philadelphia, was given the Hanlon Award, highest honor in the natural-gasoline industry, at the 36th annual convention of the Natural Gasoline Assn. of America, Houston. Presentation was made by NGAA President A. H. Weil, United Gas Pipe Line Co., Shreveport. Mr. Webber is the 21st recipient of the Hanlon Award, which is conferred annually by the NGAA for outstanding service to the natural-gasoline industry. Donor of the Award is E. I. Hanlon, chairman of the National Bank of Tulsa, and a pioneer of the natural-gasoline industry.

Prior to his war service at Washington, Mr. Webber was with Humble Oil and Refining Co. At the close of the war he became assistant to the late James E. Pew, Sun Oil Co., Philadelphia, in the operation of that company's natural-gas division. He returned to Washington in 1951 as director of the Natural Gas Production and Processing Division of the Petroleum Administration for Defense. The following year he returned to Philadelphia, but still commutes to Washington as a member of the Military Petroleum Advisory Board. He assumed his present position in 1955.

RICHARD R. NEWTON has joined the Petroleum Department of The First National City Bank of New York as a petroleum engineer. Previously he had been a corporate officer and a petroleum engineer for the Smith Newton Oil Co., in Bradford, Pa.

SOL METZER and Donald G. Wright, of Calgary, Canada, have been named to the newly created posts of district exploration geologists, and Bernard J. Kelly, of Calgary, has been appointed district development geologist for Canada-Cities Service Petroleum Corp.

FRED C. BOUCKE has been named manager, eastern hemisphere staff, of Standard Oil Co. of California. The company has also announced appointment of E. P. Fay, Jr., as assistant manager. In his new capacity, Mr. Boucke will manage staff services pertaining to the company's interests in the Eastern Hemisphere. He has heretofore served as assistant to the vice president with responsibility for that area. He joined Standard in 1937, and has had extensive experience in foreign oil activities. Most recently, he represented the company during negotiations leading to establishment of the Iranian consortium.

WALTER GREENFIELD, veteran member of Signal Oil and Gas Co. management, has retired after 27 years. He has been handling joint-venture operations for the company since 1955. Before that assignment, he had been manager of the company's crude-oil department since 1933.

THOMAS S. HORROCK has been appointed general sales manager of Sun Oil Co. Mr. Horrocks has been assistant general sales manager since 1955. He succeeds Mr. Wright.

OLE BERG, JR., has been elected chairman, and appointed managing petroleum director of Stanwell Oil & Gas Ltd.

B. D. LEUTY has been elected president of Cities Service Pipe Line Co.

W. F. Bramstedt

W. H. PINCKARD has retired as chairman and chief executive officer of California Texas Oil Co. Ltd. after 40 years of service. W. F. Bramstedt, president since 1950, has been elected to succeed him. A. J. Singleton, executive vice president, has been elected president. Mr. Pinckard joined The Texas Co. in Port Arthur in 1917, and subsequently spent more than 20 years in the Far East and other foreign posts. In 1936 he participated in the formation of the Caltex group. He became president of California Texas Oil Co. Ltd. in 1946, and chairman of the board in 1950.

Mr. Bramstedt, born in The Philippines, began with the engineering department of Standard Oil Co. of California in 1927. He held various executive positions in Canada and Alaska. He joined the Arabian American Oil Co. in 1946 as technical representative on crude-oil sales.

JOHN S. LAVENDER, JR., has been appointed supervisor of The Ohio Oil Co.'s new pipeline communications department.

JOSEPH D. HARNETT, manager of the transportation department since 1954, has been elected a vice president of The Standard Oil Co. (Ohio). As vice president for transportation, he will continue his headquarters at St. Louis, Mo., and will be responsible for the crude-oil and product transportation activities of the company—including gathering, pipe line, and marine operations.

JOHN M. SNOOK has been elected executive vice president and general manager of Consolidated Cuban Petrolum Co.

J. F. GREENE, JR., has been appointed a vice president of California Crude Sales Co., with offices at Perth Amboy, N. J. He will be responsible for sales of foreign crudes in eastern US, eastern Canada, and Caribbean area for this Standard of California operating company.

J. KLOPPER, a director since 1936, has resigned from Royal Dutch Petroleum Co. C.R.C. Wijckerheld Bisdom, barrister at The Hague and counsel to the company, has been elected a new director.

ROBERT B. CAPPS has been named division manager of the southern division exploration office of Kerr-McGee Oil Industries Inc., in New Orleans, La.

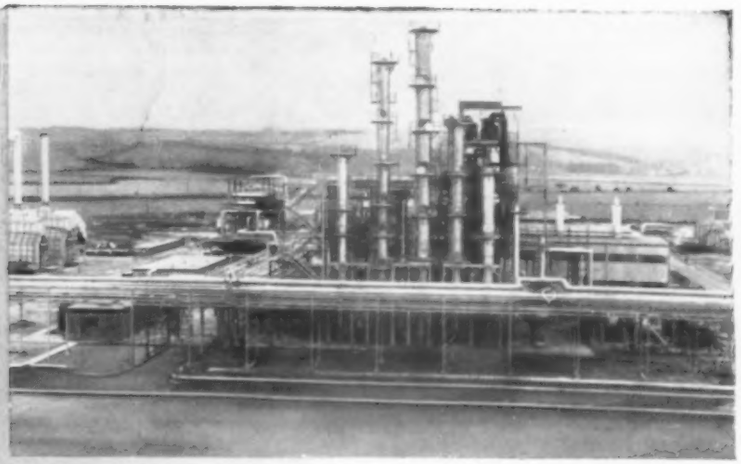
CHARLES C. JARCHOW, president and a director of American Steel Foundries, has been elected to the board of directors of Universal Oil Products Co.

GEORGE B. MAGRUDER, JR., a vice president of Southern Production Co., Inc. until the acquisition of its oil and gas properties by Sinclair Oil & Gas Co., has resigned from an executive position with Sinclair to enter the oil business as a consultant and operator.

P. H. GARRISON has been named geophysical supervisor in the Tulsa general office of Pan American Petroleum Corp. In Calgary he had been Canadian division geophysical supervisor. In his new assignment, he will be responsible for overall coordination of Pan American geophysical operations in the United States and Canada.

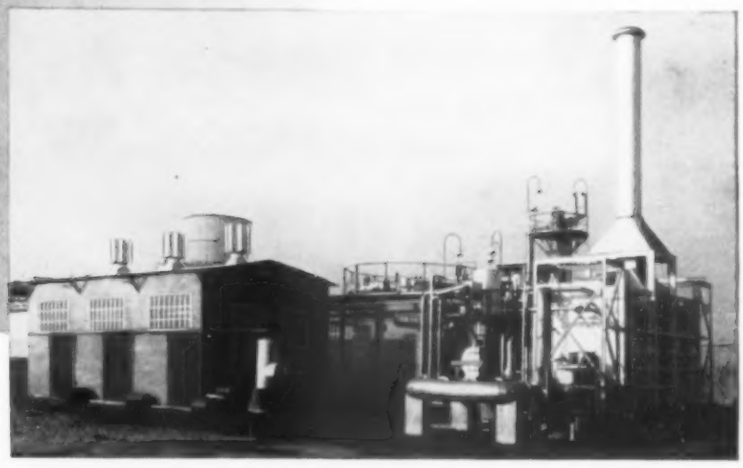
RECENT WORK in Petrochemicals

These are examples of Badger-built Petrochemicals plants commissioned within the past six months. Their design is the product of many years of experience and takes advantage of the latest American developments available to us through our U.S. affiliate.



ETHYLENE FROM NAPHTHA—U.K.
(By Courtesy of British Hydrocarbon Chemicals Ltd.)

* SYNTHETIC ETHANOL—U.K.
(By Courtesy of British Hydrocarbon Chemicals Ltd.)



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* *Process Licensed by Shell Development Company*

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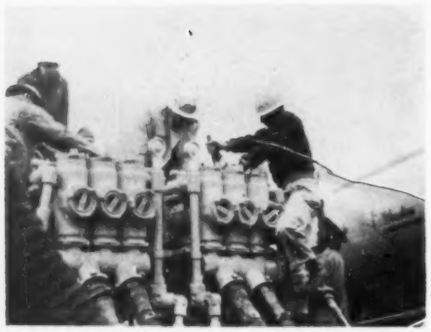

The world's most powerful fracturing unit is contained in Halliburton's new 1,200-hp HT-400 trailer. Injection pressures up to 14,000 lb can be reached with the new unit, and a maximum pumping volume in excess of 30 bbl per min.

Explosive Gas Detector

An improved portable measurement instrument, called the Atlas "Probetector," which determines accumulations of explosive gases, is now being produced by Atlas Laboratories Inc. Houston (formerly Atlas Exploration Co.). Concentrations of gas are registered on a direct-reading explosive meter which is factory-calibrated for methane and ethane gases, but may be obtained with calibrations for other gases.

"JOE" WOOD PASSES

Joseph B. Wood, 78, chairman of Technical Oil Tool Corp., Los Angeles, passed away, May 7, after prolonged illness. "Joe" Wood was widely known and respected throughout the petroleum industry as a pioneer in the development of the TOTCO drift indicator.

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Mission Advertising Award

Mission Manufacturing Co. and its advertising agency Rives, Dyke and Co., both of Houston, have received for its business-paper advertising an Award of Merit, presented recently as the climax of Associated Business Publications' 12th annual advertising competition. The award was accepted by Jack Faris, New York, Mission's export manager.

New Foster Wheeler Director

Gilbert H. Perkins has been elected to the board of Foster Wheeler Corp. Mr. Perkins replaces, on the Foster Wheeler board, Mr. H. K. Corbin.

To Inspect European Oil

Ralph R. Emery, Halliburton Oil Well Cementing Co.'s vice president for foreign operations and export sales, will make a 90-day tour of European oil centers—visiting Halliburton subsidiary operations in Germany, Italy, Austria, and Sicily.

Walton Heads Ideco

Ideco Division of Dresser Equipment Co. has been reorganized, and will be known as Ideco Inc. Concurrently, J. B. O'Connor, Dresser president, also announced appointment of G. W. "Jack" Walton as president of Ideco Inc., a manufacturer of drilling rigs and other oil-well drilling equipment.

Since 1954, Mr. Walton has been executive vice president of this Dresser subsidiary. Other officers reappointed in the new company in the same capacity as before include W. O. Cook, vice president in charge of engineering and manufacturing; G. G. Wilbur, assistant to the president and vice president in charge of export sales; and E. F. Shiels, vice president in charge of domestic sales.

Bland New Texas Eastern Head

J. D. Bland, of Shreveport, has been promoted to general superintendent of the petroleum products division of Texas Eastern Transmission Corp., according to Millard K. Neptune, new executive vice president, petroleum products division. In his new capacity Bland will supervise all operations of Texas Eastern's petroleum products system.

New SSC Appointments

Promotions for four officials of Seismograph Service Corp., Tulsa, have been announced. E. D. Wilson, assistant treasurer, was named treasurer of SSC. F. B. Leedy who, in addition to treasurer has been vice president of Seismograph Service Corp. (International) operating in Brazil, also was named vice president of Seismograph Service Corp. of Canada. Howard R. Breck, manager of the continuous velocity logging division, was named assistant vice president in charge of CVL. R. K. Finley, manager of maintenance and assembly, was named assistant vice president in charge of manufacturing.

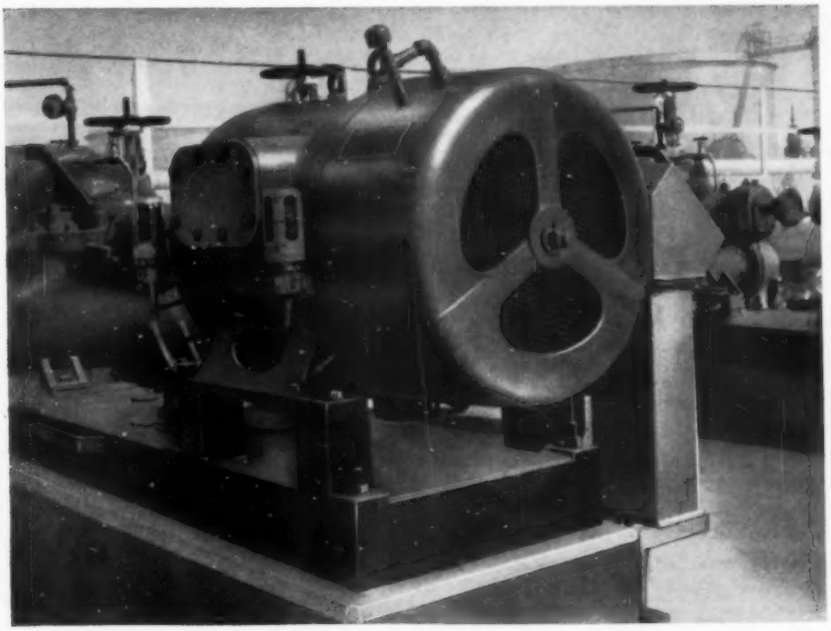
Early Turbodrill Field Tests Successful

The results of field testing of some 40 Dresser turbodrills by major drilling contractors and operating companies prove the turbodrill a satisfactory, powerful "downhole" drilling engine suitable for oil-field use, operating in a trouble-free manner, says J. B. O'Connor, president of Dresser Industries Inc., in a six months' progress report. Bit-penetration rates can be increased, and drilling costs in many areas can be reduced—especially when smaller holes are drilled.

According to Otto Hammer, Dresser's operating vice president and manager of the Turbodrill Division, the tests indicate that, under certain drilling conditions, conventional "off-the-shelf" rock bits—such as those manufactured by Dresser's Security Engineering Division—are capable of transmitting the turbodrill's higher speed and horsepower with full success. Likewise, when the turbodrill is used for hole-opening operations, drill-string (pipe) vibration is reduced considerably and higher bit weights can be used.

Dresser has now logged 13,000 ft of turbodrilling in the USA. Drilling tests are being continued, says Mr. O'Connor, and research is under way here and abroad to develop tougher drilling bits which can operate continuously at peak efficiency.

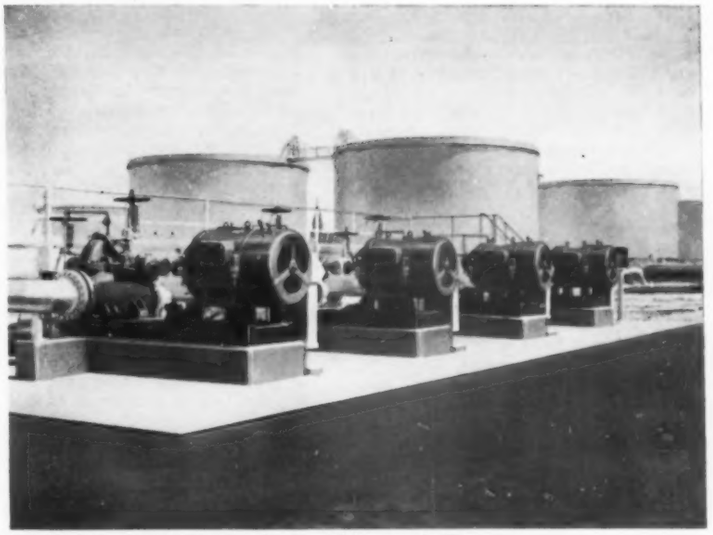
Flameproof Motors for the Oil Industry



A Metrovick 250 h. p. 1480 r. p. m. Flameproof Squirrel Cage Motor—one of four supplied to the Kwinana Oil Refinery.

Oil wells and refineries throughout the world rely on M-V equipment. Metrovick experience of motors and their proper application covers all drives in the oil industry, from drilling to refining. Some of the refineries using Metrovick motors are the Grangemouth Petroleum Refinery, Ltd., Shell Stanlow Refinery, Esso Refinery, Fawley, Trinidad Leaseholds Point-a-Pierre Refinery, B. W. I., and (illustrated) British Petroleum Company's Refinery at Kwinana, Australia.

Special arrangements were put in hand to guarantee that these motors were delivered to meet site requirements.



This photograph shows the four Metrovick Flameproof Motors driving kerosene pumps at Tank Farm Pumping Station No. 3. These motors are fitted with constant-level oil lubricators.

METROPOLITAN-VICKERS

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International News and Notes

Halt Fast Tanker Writeoffs

Eisenhower administration which only a few months ago was urging a crash program, with government aid, for construction of more tankers, now has called a halt to the aid by fast tax writeoffs which had been in effect. Gordon Gray, defense mobilizer, has announced closing of the expansion goal for ocean-going tankers now that 100 new tankers have been built, are under construction, or contracted for in the past five years. Some 45 tankers have been completed since January 1952 when goal was set.

Japan Spuds First "Deep" Rig

Japan's first rig for deep drilling was spudded in recently by Teikoku Oil Co., after religious services. Site is near the Japanese Sea, about 6¼ miles from Nagoaka, on the opposite side of the island of Honshu on which Tokyo is located. Ceremonies were conducted on "First Day of Spring," according to the old Japanese calendar. Rig is a National Supply Co. type 110, intended for wildcat drilling below 12,000 ft. Present wells in Japan have a maximum depth of less than 6,000 ft.

First ME Offshore Production Starts

Oil production has begun from the Safaniya field, first offshore oil development in the Middle East. Initial production is 50,000 b/d, with expans on scheduled to 125,000 b/d by mid-1957 and to 175,000 b/d by mid-1958. Located off the Saudi Arabian mainland under waters of the northern Persian Gulf, south of Kuwait and the Neutral Zone, Safaniya is about 180 miles north of Dhahran. A 22-in. 140-mile pipeline carries Safaniya crude south, both to the refinery and to the shipping terminal at Ras Tanura.

Production at Safaniya is from the Bahrain zone —with a gravity of 27 API. Heavier than Aramco's other crudes, Safaniya crude yields a high percentage of fuel oil, and will help Aramco meet the growing world demand for this type of oil.

To Start Persian Gulf-Turkey Pipeline

According to M. J. Rathbone, president of Standard Oil Co. (N.J.), building of a new $800 million oil pipeline from the Persian Gulf to the Turkish coast should start before the end of 1957; to be completed in 3 to 4 years. Eight British, American, French, and Dutch oil companies will participate. Under normal conditions, Suez oil shipments by 1972 should be 5 times the 1955 rate—most of the increase going to Europe. Estimated 1955 shipments of 1,125,000 b/d should rise to 6 million by 1972.

Southern Spain Has A Well

The government's INI has reported a well near Alcaraz, between Albacete and Jaen, southern Spain. It was spudded in the Triassic at 328 ft. In the Paleozio, oil stains showed up at 1,312 ft. The well has gone to 1,640 ft. This is the area of previous gas shows.

Japan Has New Oil Find

Teikoku Petroleum Co. has a discovery well at 4,950 ft at Oguchi, Nakanoshima village, 3¾ miles north of Nagaoka, in Niigata prefecture.

Oil Near Nagaoka, Japan

Teikoku Petroleum Co. has a discovery at 4,950 ft at Oguchi, Nakanoshima village, 3¾ miles north of Nagaoka, in Niigata prefecture. The new find is believed to be bigger than the company's oil field at Abase, in Akita prefecture, which is at present the nation's biggest oil deposit.

Japan Gets Saudi Arabia Concession

Japan Export Petroleum Corp. has obtained oil exploitation rights in Saudi Arabia under a provisional agreement concluded between King Ibn Saud and Taro Yamashita, president of the Japanese firm. According to Mr. Yamashita, the exploitation rights cover an area of some 2 million acres of prospective offshore oil fields on the northeastern shores of Saudi Arabia bordering offshore oil fields now operated by Aramco. The Japanese company also has received rights to exploit oil in the interior of Saudi Arabia. A Japanese oil expert is now in Saudi Arabia making surveys of the area covered by the contract. Salient points of the contract when Mr. Yamashita visited the Middle East are: 1, Japanese exploration operations are to be financed solely by Japanese capital without the medium of a Japan-Saudi joint company; 2, management of exploration operations is to be undertaken solely by Japanese engineers; 3, profits from present project are to be equally halved between King Ibn Saud and the Japanese; 4, crude available in the present project is to be left entirely to the disposal of the Japanese. The Japanese company is ready to spend about $8.5 million for the 3-year exploration project.

Accord On Assam Oil Plans

Satisfactory accord has been reached between the British-owned Assam Oil Co. and the Indian government in regard to the formation of a new rupee company to prospect for oil in Assam. Oil is to be transported through a 850-mile-long pipeline to a refinery whose site has not yet been determined. Project initially will require $160.5 million in foreign exchange.

It is nearly four years since oil was first struck in Nahorkatiya region, and hopes are that further prospecting in Nugrijan and Moran may disclose more favorable results. Details of the agreement are not available, but decision to allow the AOC to hold a major share in the exploration enterprise cannot be revoked, according to the Finance Minister. Tentative agreement has been reached as to price of crude for the refinery to be set up possibly in Calcutta. Any foreign loan to meet foreign exchange requirements will be guaranteed by the Indian government.

The new firm is to be called "Oil India." While the total investment on the project will be around $240 million, the foreign-exchange costs for prospecting company, the pipeline etc., are estimated to absorb about $160 million. The government has made clear there will be no point in embarking on a project which might involve indefinite delay through lack of equipment.

Southern France Has 2nd Well

Societe Natinale des Petroles d'Aquitaine, in which BP holds an interest through its French company (Societi Francaise des Petroles BP) has announced the discovery of oil in the second well drilled at Clermont, Landes, halfway between Puyou and Dax. The well on test produced about 300 gal of crude in just over one hour. Further test wells are to be drilled in the area.

Seria Has 450 Wells

Brunei Shell Petroleum Co. Ltd., the new Shell group company registered in Brunei at the beginning of the year, now has completely taken over from the British Malayan Petroleum Co. Ltd., which will go into liquidation—the actual transfer of day-to-day business taking place, March 15, 1957. It is estimated the new company will drill 30 wells this year, compared with 36 wells drilled by the old company last year. Current production from 295 producing wells is 112,000 b/d. In all, 450 wells have been drilled in the Seria field during its life. At present 5 drilling strings are in use, and one workover string. The current budget for the year is £3.5 million on exploration and drilling, and £2 million on capital construction.

Zanzibar Completes Dry Hole

The BP-Shell Development Co. of Zanzibar Ltd. has completed its deep test well as a dry hole at 14,281 ft. The rig is to be overhauled in Zanzibar, ready for the next test well, the location of which has not been fixed.

Sun To Search In Pakistan

An official of the American Sun Oil Co. recently was in Karachi to complete an agreement for the formation of a company to be called Pakistan Sun Oil Co. The latter is expected to spend some $2.1 million on oil exploration in the country.

Punjab Drilling Begins

Oil drilling operations in Kangra valley, in the Jwalamukhi area in the Punjab, was inaugurated by the governor of the Punjab (C. P. N. Singh), April 20. A 45-ton heavy Romanian derrick marked the first phase of exploration on the Sivalik ranges of the Himalayas. Indian and foreign experts visiting Jwalamukhi during the past two years were hopeful of oil-bearing rocks at 8,000 ft to 9,000 ft.

This is the first oil drill in the public sector in India. Operations, which were to have started in November 1956, were delayed by weather conditions. Drilling is carried out under government auspices with the help of an $800,000 rig purchased from the Romanian government. A Romanian technical team heads the operation and trains Indians. Work on the derrick site, started January 24, was completed in April. The services of a Soviet engineer have been obtained for two years to help drilling in this and other areas.

The drilling site is 55 miles from the railhead at Pathankot. A special 4½-mile road was cut through solid rocks to transport the 1,300 tons of heavy equipment to the drilling site; 7,000 persons were employed in the construction of a road to another drilling site, where a Romanian drill will start soon.

In all, there are nine drilling locations in the Kangra valley—three in Jwalamukhi area and one each in Janauri, Dharamsala, Yol, Nana, Nurpur, and Bhal. A Soviet team of experts visiting India recently stated that oil and gas potentialities of the Jwalamukhi area merit deep drilling. According to present plans, drilling will be carried in some points up to 15,000 ft, while structural drilling will be confined to 3,000 ft at some other points. Completion of drilling operations should take about six months.

Pipeline Under The Gironde

Esso Standard of France has received permission from the Bordeaux port authorities to lay a deep-sea pipeline acros the estuary of the Gironde, France, to carry oil from the Parentis field to Esso's new refinery at Ambes, on the north side of the estuary.

Sicily To Drill Deep Test

After long and intensive geological and geophysical surveys, British Petroleum's subsidiary in Sicily was preparing to sink a second deep test well in southeast Sicily, at Troitta, near Caltagirone. New well is Troitta No. 1, and a drilling rig has been sent from the United Kingdom.

ICA Guaranty For Cabot France

Godfrey L. Cabot Inc., Boston, has formed a subsidiary in France, Cabot France SA, to manufacture 20,000 tons a year of carbon black, it is disclosed by the International Cooperation Administration. This is about the quantity France imports in a year. ICA said it has signed a guaranty with the firm covering loss of the property by expropriation and convertibility into dollars of earnings in francs.

BP's Oil Search In France

The French oil company, Société des Pétroles de Valence, in which British Petroleum Co. Ltd. holds a 50% interest, reports the first well drilled at St. Lattier in eastern France is now practically complete—with good results. A second well is to be drilled about 10 miles north of the first one.

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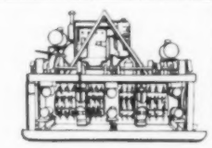
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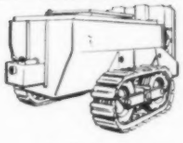
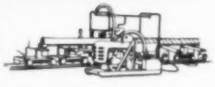
pipeline cradles


pipeline kettles

Cinch hydraulic pipe bending machine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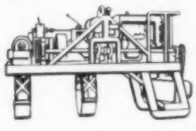
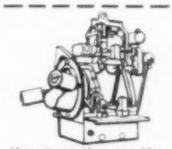
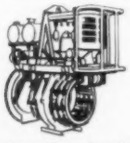
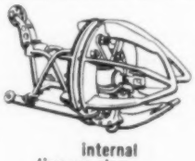

road boring machine

pipe cutting & beveling machine


line traveling coating & wrapping machine


line traveling cleaning & priming machine

ditch padder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London Letter

By E. Lawson Lomax

Figures of Petroleum Information Bureau indicate that, despite rationing and Suez restrictions, total UK oil consumption for 1956 was up 8.5% over 1955. Largest 1956 output was in fuel oil (gas, diesel, boiler, and refinery fuel). Representing 44% of total output, fuel-oil production was 220,000 b/d, against 41% in 1955, for an increase of 14%. Consumption of gas and diesel oils was 10.5% above 1955, due principally to increased use in central heating and agriculture. Motor gasoline increased only 1.3% over 1955 because of rationing in last quarter of 1956. Premium grades were preferred by both private and commercial users. Kerosine use is increasing as a domestic fuel. Rise of 9% in bitumen consumption indicates increasing road improvements, which will probably be more pronounced next year.

Fuel Institute Gives Luncheon

Some 700 members and guests attended the annual luncheon of the Institute of Fuel, held in London, April 25. Institute President J. R. Rylands presided, and guest speaker was Sir John Maud, permanent secretary to the Minister of Power.

Slotted-Angle Design Improved

Supaslot Angle Co. (GB) Ltd. has announced improved design of SUPASLOT Major No. 14 and 12 gauge angles. Result is greater strength, and reduction in positive location to a 1½-in. span from the former 3-in.

Canal Users Require "Guarantees"

Delegates to the annual meeting of the International Chamber of Shipping in London, April 5, discussed implications of the current Suez situation. Representing 18 nations whose ships normally are major users of the canal, these nongovernmental shipowners expressed the opinion that secondary to possible risks in resuming canal use by their ships are "guarantees" by the canal administrative authorities safeguarding future upkeep and development. As soon as the political situation permits, ICS will resume its efforts (begun as far back as April 1955) to insure the same sort of consultation and negotiation in matters of common interest as existed previously between the Suez Canal Co. and commercial users of the canal.

Company News

Directors of Royal Dutch Petroleum Co. proposed to the general meeting, May 29, a total 1956 cash dividend of 5.00 florins per share. Net income of Royal Dutch-Shell group in 1956 amounted to £180 million (sterling).

Total declared dividends for 1956 of London & Thamas Haven Oil Wharves Ltd. amount to 17 12%. Total profit was £859,384; and net after taxes, depreciation, etc. was £299,842.

For year ended July 31, 1955, Trinidad Petroleum Development Co. Ltd. has declared interim dividend of 3 pence on each ordinary 5-shilling share—free of income tax.

Total dividends for 1956 of Manchester Oil Refinery (Holdings) Ltd. amount to 12½%, less tax. Net profit was £108,154.

Jet Bits Used For First Time

"Jet" drilling bits are being used for the first time in England for oil exploration. At BP's Egmanton field, Nottinghamshire, a rig recently drilled 900 ft in one day with these bits. Although this footage has been surpassed with standard bits, it represents fast drilling for UK conditions. These bits are equipped with nozzles through which drilling mud is forced to the bottom of the hole at high pressure, and rock cuttings are carried away immediately—thus preventing bit wear.

Hugh C. Tett

J. P. Berkin

Personnel

J. W. Platt, a managing director of Shell Petroleum, has decided to retire from his several managing offices in the Royal Dutch-Shell group as of June 1957. He will remain a director of Shell Transport & Trading and of Shell Petroleum Ltd.

J. P. Berkin, a board member of Shell Petroleum Ltd. since November 1953, has been appointed a director of Shell Transport & Trading; and, as of July 1957, will become a managing director of Shell Petroleum Ltd., and a principal director of NV Bataafsche Petroleum Mij.

Esso Petroleum Co. Ltd. has announced appointment of Hugh C. Tett as managing director as of May 31. He will succeed Sir Leonard Sinclair, who remains chairman. A graduate of the Royal College of Science, Mr. Tett joined Anglo-American Oil Co. in 1928. In 1939 he became a technical adviser to the Petroleum Board. After service in Germany and France during the war, he returned to Esso Development Co. in 1947. Later he joined Esso, of which he was made a director.

J. Dummelow has been appointed assistant manager, Publicity Department, Metropolitan Vickers Ltd.

Air Pumps Ltd. announce appointment of T. O. Orr as sales manager.

Mobile Oil Co. has announced formation of a consumer fuels sales department, with A. Peck as manager. For a number of years Mr. Peck had been divisional manager in Cardiff.

C. C. Wakefield & Co. Ltd. has announced election of L. M. Broadway as deputy chairman of the board. Managing director since 1954, he will retain that office.

A. W. Hardie has been appointed general manager, Scottish Oils and Shell-Mex Ltd. Suceeding him as divisional manager, Eastern Division, Shell-Mex and BP Ltd., will be T. C. Richardson, since last year divisional sales manager.

John M. Murphy has been appointed divisional accountant for North Ireland Division of Shell-Mex and BP. C. A. Pink becomes assistant manager (commercial) for kerosine and agriculture, succeeding Mr. Murphy.

Henry Meadows Ltd. has announced appointment of Arthur Wood as managing director, succeeding Alister D. Mackay. Mr. Mackay has been appointed to the board of the parent Associated British Engineering Ltd., and also remains deputy chairman of Henry Meadows Ltd.

Appointed a director of Canadian Vickers Ltd., J. E. Richardson also became managing director as of May 1. Mr. Richardson had been deputy general manager and engineering manager, Barrow Works, Vickers-Armstrongs (Engineers) Ltd.

Graham F. Towers has accepted invitation of the chairman of British Petroleum Co. Ltd. to become chairman of the board of BP (Canada) Ltd. Until 1954 Mr. Towers had been governor of the Bank of Canada. He is a member of the Canadian Committee of the Hudson's Bay Co., and a director of Canada Life Assurance Co.

CBMPE Entertains European Manufacturers

Council of British Manufacturers of Petroleum Equipment dinner, April 8, had as guests the Federation of European Petroleum Equipment Manufacturers. CBMPE G. V. Sims was chairman, and guest speaker was Gerald Nabarro, MP (Kidderminster). Continental guests were taken on an inspection tour of British instrument plants.

Record Shell Equipment Purchases

Royal-Dutch Shell group gave record petroleum-equipment orders in the UK during 1956—valued at approximately $262.5 million—$22.5 million over 1955. Exports represent 75%; balance for UK refinery and research maintenance and expansion. These orders are exclusive of large expenditures for Shell's tanker fleet. They represent 40% of all business placed in the UK by the British oil industry, and materials and equipment exported represent 1.5% of all UK exports.

Tanker News

On April 26, the 38,000 dwt STS "Zaphon" left the Tyne on her maiden trip to the Persian Gulf. Her cargo will be Middle East oil for a northwestern European refinery. Largest tanker under British registry, she is the flagship of Shell's tanker fleet.

Launched from Harland & Wolff Ltd.'s Belfast shipyard, April 16, was the 31,000 dwt STS "Vitrina" built for Shell Tankers Ltd.

French Interests Buy Brown Drilling

International Brown Drilling Corp. and Brown Marine Drilling Co. have been sold to Société Financière de Transports et d'Entreprises Industrièlles, generally known as SOFINA, of Brussels, Belgium, and to interests represented by Lazard Freras & Co.

E. C. Brown and his present organization will continue as the operating personnel of the three companies. Mr. Brown is chairman and chief executive officer; Reginald V. Towner, president; and Newell B. Hunnicutt, vice president.

International Brown Drilling Corp. is presently operating three rigs in Venezuela. In November 1956 operations were begun with one rig in Turkey, and the second rig in that country will shortly commence operations. Beginning with work in Saudi Arabia in 1946, Brown operations were expanded to include drilling on Bahrain Island, Kuwait, Saudi Arabia Neutral Zone, Australia, Trinidad, Venezuela, and Turkey. In addition, a contract has recently been completed in New Zealand with the drilling of eight steam wells. The operations in Australia and New Zealand were conducted by Brown Drilling Co. of Australia Ltd., a wholly owned subsidiary of International Brown.

The purchasers plan an immediate further expansion of operations, and are particularly optimistic about such areas as Venezuela and Turkey, and other areas outside the United States.

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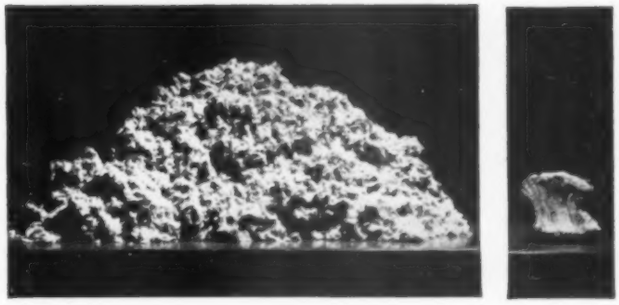

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THERMAL CONDUCTIVITY K. B.Th.U. in. sq. ft. hr. in. °F.			0.43			0.47			0.53		
MEAN TEMPERATURE °F.			250			350			450		
Nominal Pipe Size	O.D. pipe	Thickness of Insulation	Heat Loss B.Th.U. sq. ft. hr.	Effic. %	Surface Temp. °F.	Heat Loss B.Th.U. sq. ft. hr.	Effic. %	Surface Temp. °F.	Heat Loss B.Th.U. sq. ft. hr.	Effic. %	Surface Temp. °F.
6"	6¼"	1"	135	87·7	126	233	90·6	167	354	92·5	218
		1½"	102	90·8	107	177	92·9	135	270	94·3	171
		2"	83·6	92·4	97	145	94·1	118	223	95·3	145
		2½"	71·8	93·5	91	125	95·0	107	192	96·0	128
		3"	63·5	94·2	86	110	95·5	100	170	96·4	117
		3½"	57·3	94·8	83	100	96·0	95	154	96·7	109
		4"	52·6	95·2	81	91·7	96·3	91	142	97·0	103
8"	8⅝"	1"	130	88·0	127	225	90·8	169	341	92·7	222
		1½"	97·7	91·0	108	169	93·1	137	258	94·5	174
		2"	79·2	92·7	98	138	94·4	120	211	95·5	148
		2½"	67·4	93·8	92	117	95·2	109	180	96·1	131
		3"	59·2	94·6	87	103	95·8	102	159	96·6	120
		3½"	53·2	95·1	84	92·7	96·2	96	143	96·9	111
		4"	48·5	95·6	82	84·6	96·5	92	131	97·2	105

These figures are compiled from results of official tests by THE NATIONAL PHYSICAL LABORATORY, TEDDINGTON, computed in accordance with formulae shown in BRITISH STANDARD SPECIFICATION appendices.

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E. V. McCollum *Walter R. Mitchell* *John A. Gillin* *Craig Ferris* *A. E. McKay*

International Geophysical Combine

A new organization has been formed by three nationally prominent geophysical companies to provide worldwide geophysical exploration services. Known as NAMCO International, the new organization represents the combined facilities and services of National Geophysical Co. Inc., Dallas; E. V. McCollum & Co., Tulsa; and Continental Geophysical Co., Fort Worth.

According to John Gillin, president of National Geophysical, each of the concerns involved will continue to operate as an independent company in the handling of domestic and Canadian geophysical work, but will pool resources for international activities. "Through this joint endeavor, NAMCO International will be able to provide the world petroleum industry with an integrated service, the necessary specialized equipment and qualified personnel for performing comprehensive geophysical exploration surveys throughout the world," Mr. Gillin said.

Principals of the new organization are John Gillin, president, and W. R. Mitchell, executive vice president, National Geophysical; E. V. McCollum and Craig Ferris, partners of E. V. McCollum & Co.; and A. E. "Sandy" McKay, president, Continental Geophysical; and headquarters for NAMCO will be at 8800 Lemmon Avenue, P.O. Box 13127, Dallas, Texas.

Graves Now Transportation Chairman

B. I. Graves, of B. I. Graves Associates, San Francisco, has been named chairman of a 25-man committee on transportation, it is announced by Walter S. Hallanan, chairman of the council.

L. F. McCollum, of Continental Oil Co., Houston, is chairman of another council committee on oil-producing capacity of the domestic industry, as of January 1 of this year.

Gulf Elevates Three

Gulf Oil Corp. has named three new production officials at its Pittsburgh headquarters. They are E. D. Brockett, Jr., formerly vice president and manager at Houston, as coordinator for production; S. G. Sanderson, formerly Tulsa vice president, as Houston production manager, and N. C. Simpson, formerly Western Hemisphere coordinator, as Tulsa production manager.

Dresser Sees Record Year

R. E. Reimer, vice president, secretary, and treasurer of Dresser Industries Inc., Dallas, has estimated Dresser's sales would be approximately $275 million in 1957, $4.75-$5.00 per share by comparison with $3.97 for the prior year. As of the end of February, the company's backlog of unfilled orders was $88,650,000, the highest level in the company's history and some 25% above the backlog as of October 31, 1956.

Suspends Tanker Schedules

The suspension, effective April 18, of schedules under which worldwide tanker movements have been coordinated to speed oil to Western Europe recently was announced by Assistant Secretary of the Interior Felix Wormser. The three suspended schedules will be maintained on a standby basis until further notice. Schedules 1 and 2 provide for extensive rearrangement of tanker schedules, principally in the Persian Gulf, the USA Gulf Coast, eastern Canada, South America, and the Mediterranean. Schedule 3 provides for actions to minimize cross-hauls of tankers in the east-of-Suez area of the Eastern Hemisphere.

Although tanker traffic through the Suez Canal has not been resumed, suspension of the schedules is now possible because the oil lift has reached a high degree of effectiveness, Mr. Wormser said. The "Plan of Action," the fact-gathering activities of the Middle East Emergency Committee, and the liaison with its European counterpart will be continued until there is again a substantial tanker movement through the Suez Canal.

Selas Forms Export Division

An export division has been formed by Selas Corp. of America under the management of James S. Shute, formerly assistant to the manager of the combustion equipment division. The new division will service the newly organized European division which has its headquarters in Geneva.

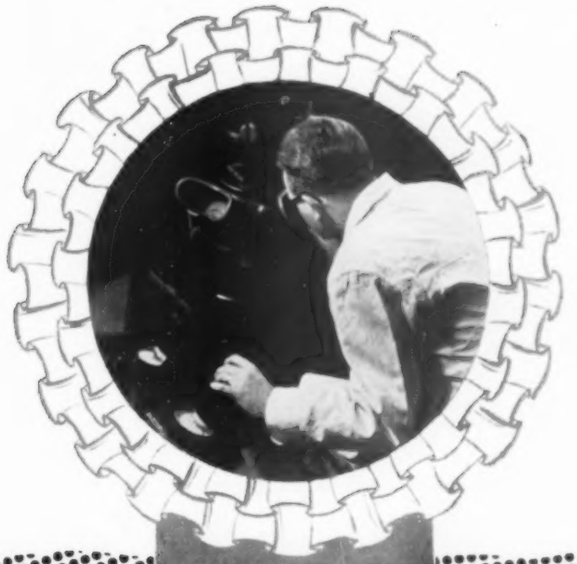
Electrical Logging Seminar

A daily average of more than 150 geologists and engineers of major and independent oil companies attended the recent three-day seminar on electrical logging sponsored by Perforating Guns Atlas Corp., at Houston. Dr. R. H. Hamilton, Tulsa consulting geologist and log analyst, conducted the sessions.

Four similar series of seminars had been conducted by Dr. Hamilton and sponsored by PGAC since last spring.

Dr. Hamilton reported that electrical logging of wells now costs operators some $60 million annually. He said that he considered a change to induction logging would entail an unnecessary expenditure of about $30 million additional each year for even less data thereby obtained. Dr. Hubert Guyod, Houston consultant on well logging, attended one session of the seminar, and was invited to answer technical questions.

ON STRIVING FOR PERFECTION



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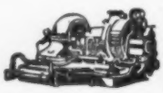

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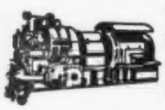

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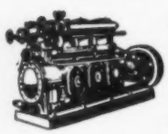

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In the blinding desert dust storms which sweep the area of the Iraq pipelines, VOKES filters have twice been chosen for the important task of protecting pumping stations and ancillary equipment . . . proof indeed of the important part which VOKES filtration is playing throughout the world in safeguarding plant and machinery from wear, breakdown and unnecessary depreciation.
Below are shown three typical aspects of VOKES protection . . . protection which cannot be jeopardized by the non-availability of element replacements because VOKES FILTERS ARE CLEANABLE.

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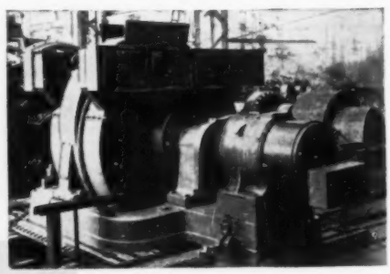
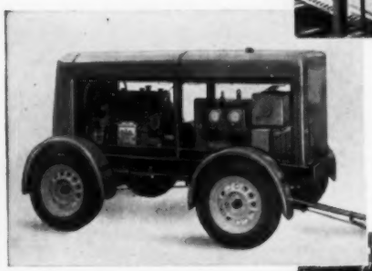
Electric motors breathe too . . . and these VOKES filters have proved conspicuously successful in preventing the grave damage hitherto sustained during operations in impure air conditions.





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Compressors . . . portable generators . . . welding sets . . . power packs . . . all need protection against the ingress of abrasive dust, whether by air-intake, lubricating oil or fuel.

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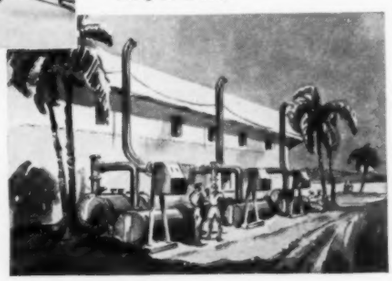
Under abnormal conditions like these, engines have to be doubly protected and these large diesel engines are therefore fitted with Microvee dry fabric filters for cleaning the intake air. Vokes Filters are also specified for atmospheric air filtration in the ventilating systems of many of the desert buildings.



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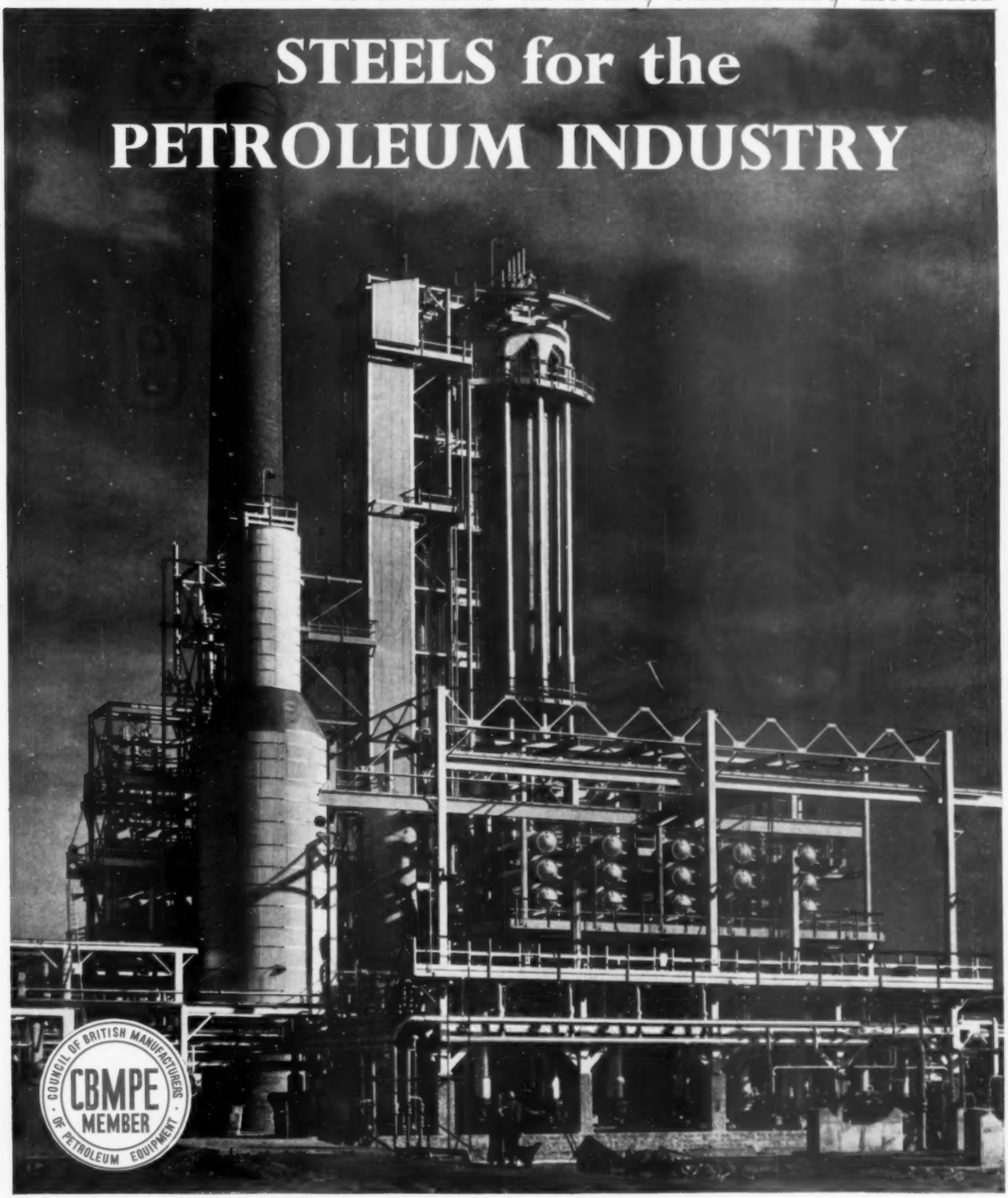

"A Symphony in Steel" —A British Petroleum Company photograph

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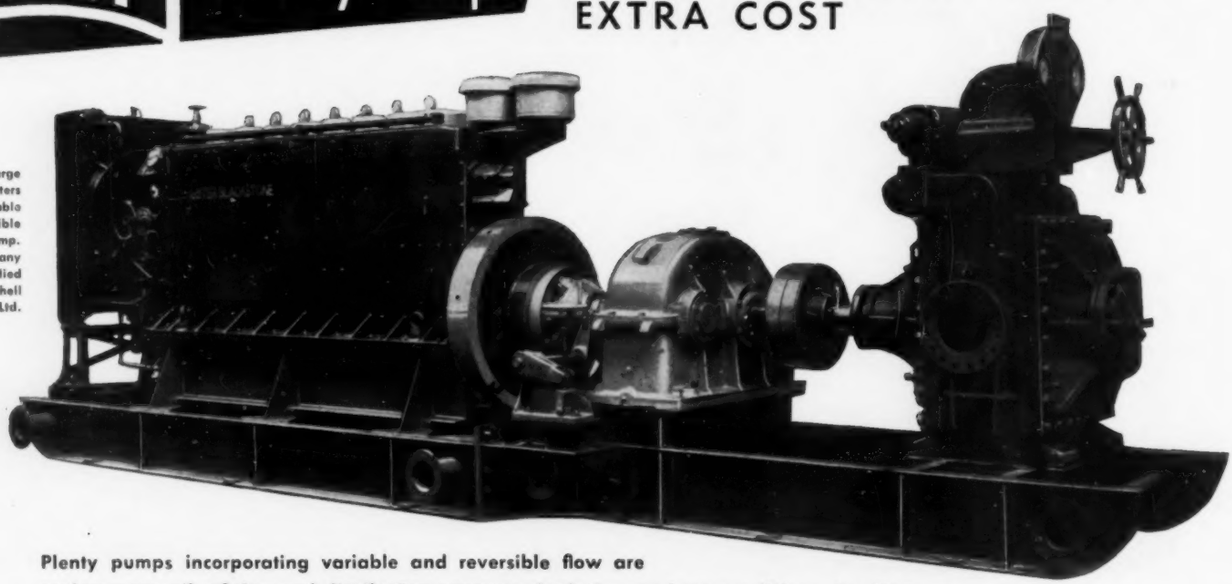

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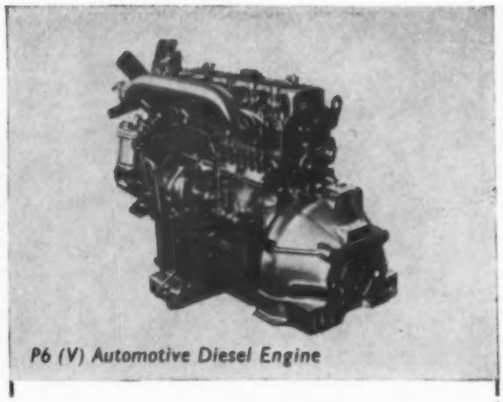
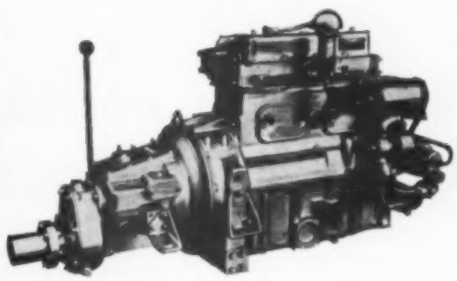


P6 (V) Automotive Diesel Engine



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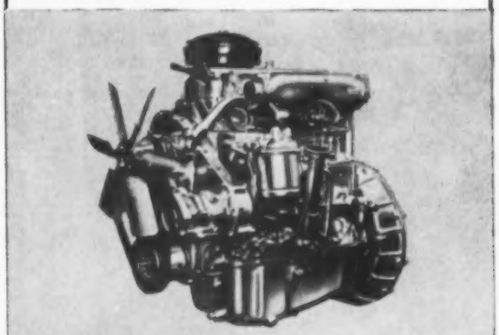

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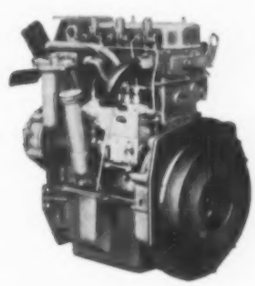

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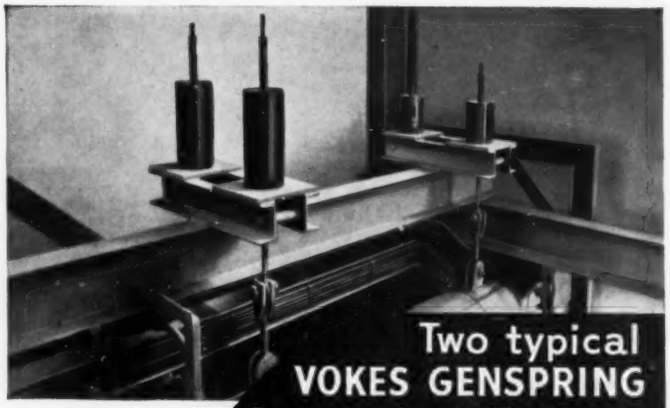
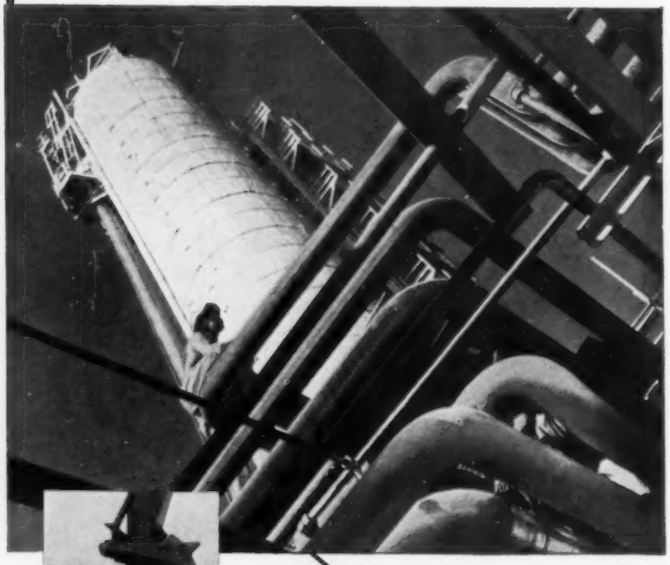


Photograph by courtesy of The Associated Ethyl Company Limited.

Two typical VOKES GENSPRING hanger installations in the oil industry

IN ADEN, The British Petroleum Company's new refinery came on stream in July 1954. Many sections of this complicated process plant piping demand the finest and most accurate suspension methods, and this requirement has been met by the installation of Vokes Genspring Variable Support Hangers. The Associated Ethyl Company Limited have also made use of these Vokes Genspring Hangers at their Ellesmere Port Works in Cheshire.



Photograph by courtesy of The British Petroleum Company, Limited.

VOKES GENSPRING Variable Support Hangers are specifically designed for the control of vibration and limited thermal movement of piping, but where piping systems need to be 'floated' to offset the efforts of extensive movement, Vokes Genspring Constant Support Hangers should be used. The full range is detailed in the Vokes Genspring catalogues available on request.

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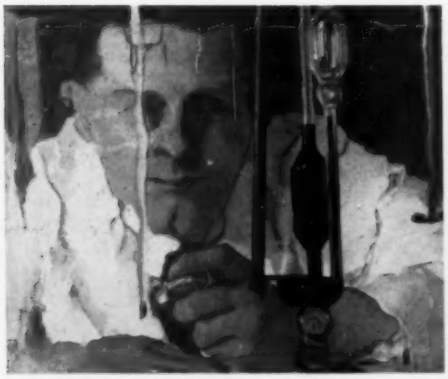

Seen distorted through the water bath which maintains the critical temperature of his apparatus, a physicist checks the viscosity of a batch sample of 'Pyrene' Foam Compound. The test determines that when brought into action 'Pyrene' foam will retain its free-flowing yet tenacious characteristics at all normal operating temperatures, down to 20° Fahrenheit.

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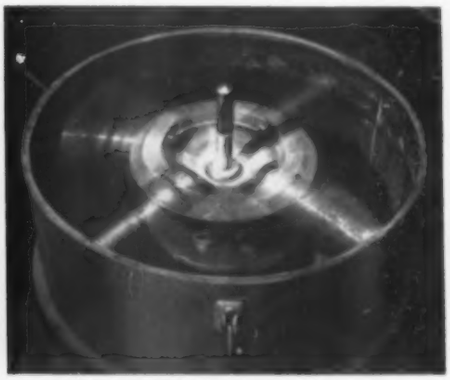

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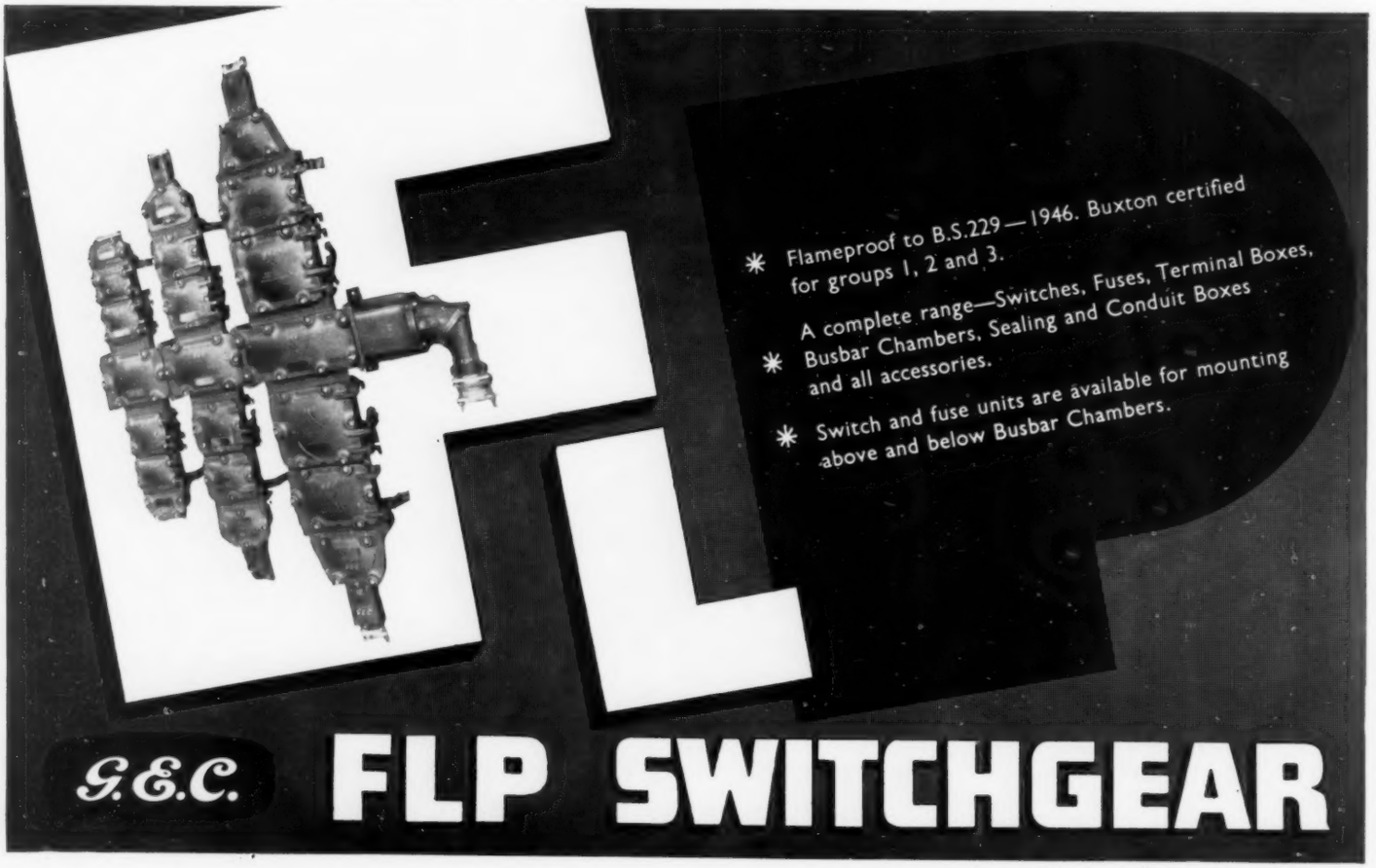
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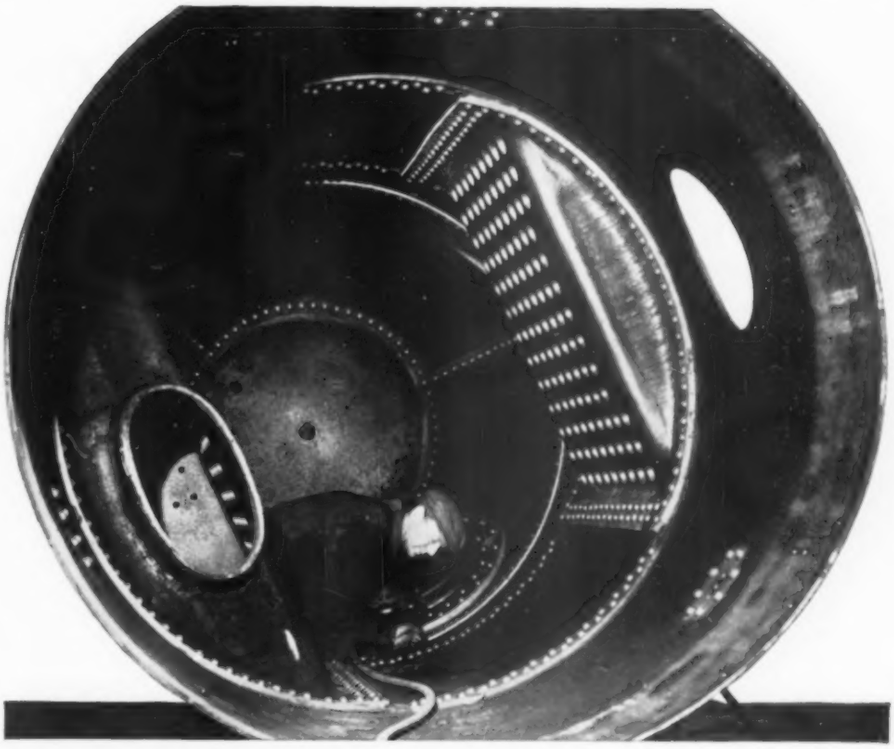
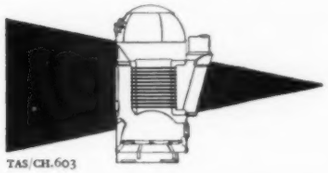
When the boiler Shell has been riveted, it is laid on its side on rolls: all plate corners are rounded off, thus allowing internal seams to be caulked continuously with a pneumatic hammer. No caulking is permitted on the external seams which are fullered with a broad tool. All rivet heads are examined carefully at this stage, and later, during the hydraulic inspection, test Caulkers examine every seam and rivet head to ensure that there are no leaks however slight. The above illustration shows a pneumatic Caulker working on an internal seam.





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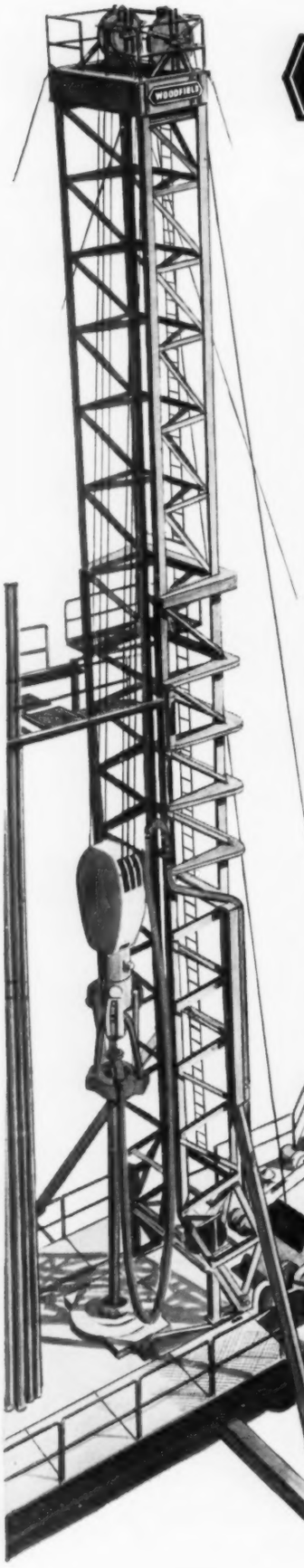

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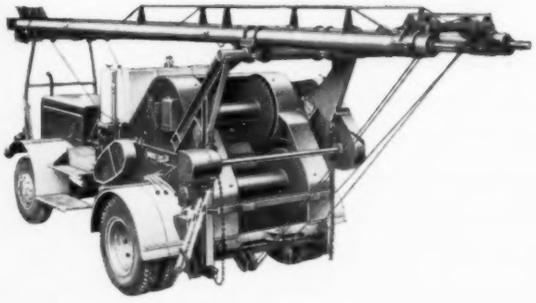
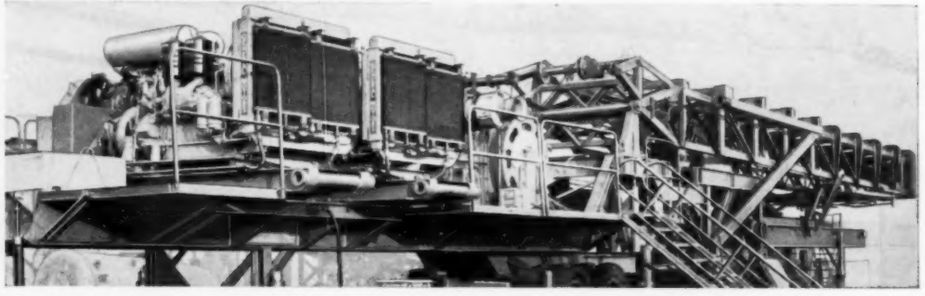


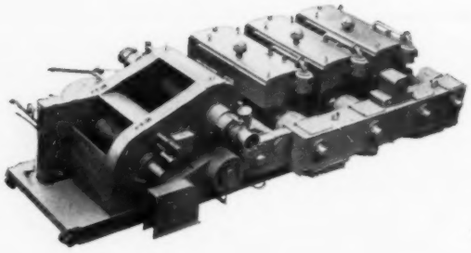


Top illustration:
Woodfield "Fieldmaster" Mobile Well Servicing and Workover Rig. Well depths up to 4,000 ft.

Centre illustration:
WOODFIELD built IDECO Hydrair H525 Dual Rambler drilling and servicing rig for wells 7,000/8,000 ft. depth. Drilling to 7,500 ft. with 4½" drill pipe.

Right illustration:
WOODFIELD built IDECO Hydrair H.40-D Double drum draw-works with 3 AEC engines, 450 H.P. and 4 shaft drive compound.

Lower right illustration:
WOODFIELD built IDECO H20 double drum Well Servicing Rig. Well depth 3,000-4,000 ft.



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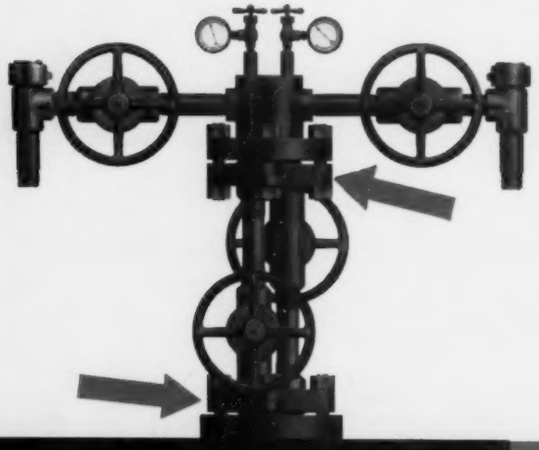

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